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AND A DIGEST OF MEDICAL LITERATURE.

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18,764/B/1

pt XV
(vol 3, pt 6)

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by BRUCH. Compound granular cells are very common in cancer, and are to be considered as evidences of degeneration of the cancer-cell. The greater their number and agglomeration, the greater the degeneration. The fatty degeneration is rarely uniform throughout a cancerous growth; commonly, whilst one part is converted into a fatty network, another is only partially so changed. This accounts for cancer having such a tendency to spread to other tissues, and for the destruction of one part being rarely attended by the reduction of the whole mass. Sometimes, however, the fatty degeneration is associated with the fibrous degeneration (§ 82.), and extends to the whole morbid structure; and it may then be further associated with an early stage of the calcareous transformation next to be mentioned. (BENNETT.)

85. (*c.*) A cancerous growth may degenerate into an accumulation of the *earthy matters* originally contained in the exuded matter. This form of cancerous degeneration is analogous to that sometimes observed in tuberculous formations. The cells break down, the more fluid and soft parts are absorbed, and the mineral parts are left concreted in the form of a calcareous mass or masses, of various sizes and shapes. This degeneration of cancer is very rare. Dr. WALSHE appears not to have met with it; although he mentions the bony lamellæ, which are continuous with part of the skeleton, and which characterise certain cancers connected with the osseous structure. Dr. BENNETT has however observed it in two instances. In one he observed mineral masses mingled with broken down cancer-cells in the mesenteric and epigastric glands, "some of which felt hard from calcareous depositions, others were infiltrated with a putty-like substance, and a few were composed of an external shell of hard calcareous matter; whilst their interior consisted of a semifluid, gritty, diffluent material, which flowed out on breaking them."

86. (*d.*) The *three kinds* of degeneration of cancerous growths may be variously associated in retrograde cancer; these may be the fibro-fatty degeneration, with either element in excess, or one or both these conjoined with the accumulation of mineral matters in smaller or greater masses. In these cases there is generally a loss of substance, occasioning a sinking inwards, with puckerings of the adjoining surface. These changes occur only in cancerous growths of considerable duration, without ulceration or the formation of a cicatrix, as observed in the mamma when the nipple is retracted, and in the surface of some cancerous tumours. VIRCHOW ascribes the central depression in the white encephaloid masses of the liver to this cause. Dr. BENNETT views the stellate puckerings on the surface of cancerous growths as far from uncommon; and certainly when this appearance exists there must necessarily be loss of substance and contraction of surrounding tissues; and these changes can only result from a partial degeneration of the morbid structure, more especially of the older parts of it, although an extension of it to adjoining parts may actually be proceeding. I may therefore conclude, with the writer just mentioned, that cancer may undergo transformations, tending in very rare cases to a spontaneous cure; and that these transformations are into a fatty or a calcareous matter, — that the morbid growth is checked, and that it consequently shrivels up, some of the softer parts being absorbed, the rest remaining inert. The contraction of the surrounding parts in these cases, and the fibrous stroma of the cancer, constitute the puckerings and cicatrices observed as evidences of a cure. Dr. BENNETT considers that the facts which he has adduced are unequivocal proofs that a cancerous growth may undergo spontaneous cure. In the case of a lady nearly related to, and almost constantly under the observation of the author, a cure certainly took place without any local treatment, the constitutional means about to be mentioned (§§ 122, 123.) having been assiduously employed.

87. ii. THE PATHOLOGICAL RELATIONS OF OTHER GROWTHS. — This subject has been noticed, as to most of what is known respecting it, when describing the anatomy of non-cancerous tumours, and in the article DISEASE (§ 110.). Fibrous, epithelial, cartilaginous, and fatty growths, or those formations which are not adventitious as respects the œconomy (see DISEASE, § 111. *et seq.*) may be ascribed to an error in nutrition, or to a hypertrophy or excessive deposition or nutrition of these several structures in the parts in which they occur. The cause of their origin and development is not known, although certain circumstances connected with their formation have been noticed. But, why either of these formations should occur in preference to the others we are ignorant. Certain of them may be caused by an injury of, followed by increased exudation into a part, the exuded fluid undergoing changes favouring some form of nutrition in preference to others; but the same kind of tumour may occur without any such or any manifest cause. Tumours may form in the ovaria, or even in the substance of the uterus, or rather within the ducts and uterus, owing to an imperfectly developed or an unimpregnated ovum, detached partially or altogether, and arrested in either of these situations, sexual excitement having been imperfectly gratified or insufficiently developed. Other morbid growths are to be ascribed to an original constitutional vice, as the scrofulous and tubercular; and some are more or less dependent upon a constitutional predisposition acquired at an antecedent period, as the sarcomatous, fatty, and some others described above.

88. *A. May morbid growths, not originally scirrhous or cancerous, be transformed into either of the forms of cancer?* — This question has been differently answered. As respects certain tumours or growths, as the tubercular and enchondromatous, no such transformations take place; but as regards some others the change is possible, although not demonstrated. Dr. BENNETT remarks that growths furnished with blood-vessels, such as the fibro-nuclear, epithelial, and fatty, may possibly be so changed, although it would be difficult to establish the change. But with respect to fibrous growths, the result of a simple exudation, or hypertrophy, at first of purely local origin, its occurrence seems to him to be absolutely proved. "According to LEBERT, inflammation (simple exudation), tubercle, and cancer, are separated by distinct characters, originate from separate blastemata from the first, and never pass into each other. In this opinion I think he proceeds too far; for why may not a cancerous exudation be formed into the filaments of a vascular, fibrous, or fatty tumour,

as well as among the filaments of the normal areolar tissue of the body? We are continually meeting with cases where a blow or injury on a part producing a swelling with the ordinary symptoms of inflammation is, after a time, followed by cancer. An indolent tumour may exist for years, and then suddenly assume the characters of cancer. Are we to suppose that such a tumour was composed of fibres and cancer-cells from the first, and that the growth of the latter had remained stationary all that time; or that nothing but a fibrous tumour existed at first, in which cancer-cells were afterwards formed? The latter appears the most reasonable proposition."* (p. 217.)

89. *B. The enlargement of growths* takes place from blood-vessels, which either permeate the mass, or supply only portions of it, or reach to a greater or less extent of its surface. "In the first the growth is said to enlarge by intussusception; in the third by pure imbibition; in the second by both means. These distinctions are less important than they on first view seem; the perfect nutrition of the extra-vascular natural tissues proves, as a general fact, the vigour and efficacy of the imbibition process; and, in truth, imbibition is at play in all nutritions; for the nutrient elements of vascular tissues must be imbibed through the coats of their vessels, and it may be in addition through a stratum of cells. Enlargement by intussusception differs therefore from that by imbibition, in degree rather than in kind. In whichever way conveyed to the seat of growth-formation, the nutrient material, at first fluid, is *evolved* and *appropriated* by continuous cell-generation. Now this cell-generation may be affected on an *endogenous* or an *exogenous* plan. When the plan is endogenous, the germs of young cells are evolved and contained within older ones; those secondary cells are endowed with a similar procreative faculty; the tertiary series are in like manner fecund, and so on. Here a single cell may be regarded as the *potential embryo of an entire growth.* When, on the other hand, the plan is exogenous, the germs of new cells are not found within, but lie, and are evolved outside old ones."

90. "Where endogenous evolution prevails, and a cell is, potentially considered, a tumour in futuro, the perpetual production of similar cells is easily intelligible; the offspring that follows is as the parent that went before. But, in exogenous growths the continuous germination of infinite series of like cells is not readily conceived. It may be surmised that, when a series of cells has sprung into being, this series acts on the evolution of succeeding ones, as a natural vascularized is known to do on the generation of epithelium cells; the formed series so influences newly-exuded blastema (of which it constantly excites the accession), that this shall produce a new series of cells similar to itself. But, however the perpetuation of like cells be understood, be it remembered that the thing itself has its limits; for deposits may appear in growths, pseudo-tissues are among their frequent constituents, and a growth of one kind may establish itself a nidus within the area of another generically dissimilar. Elder cells thus seem (within certain limits) to cause the increase, and regulate the qualities of younger ones. Younger cells are, on the other hand, more or less active agents in effecting the destruction of the older ones; less so in endogenous growths, where the elder may increase materially in size (as their contained brood multiplies), and acquire thickened walls; more so in exogenous growths, where such enlargement of cells is not witnessed, and where the production of young is coeval with the disintegration of old ones." —(Dr. Walshe, art. Products, Adventitious, *in Cyclop. of Anat. and Physiol.,* vol. iv. p. 120.)

91. *C. The reproduction of growths or tumours* is of importance as regards the diagnosis as well as the treatment. Dr. Walshe, in his very able article just quoted, observes that "growths of all descriptions are liable, when removed spontaneously or by art, to be *reproduced* in the spot they previously occupied, if the removal have not been absolutely complete. The particles left behind act as attractive forces for new blastema convertible into cells, similar to those of which themselves are composed. This mode of reproduction (as it is erroneously called, for it is nothing more than enlargement, facilitated by removal of pressure of pre-existing substance) occurs with growths of all kinds, cancerous, sarcomatous, fibrous, fatty, enchondromatous, erectile, &c. But it would appear that in some cases of surgical removal, when the whole mass has, as is presumed, been extirpated, a new growth vegetates in its place. The difference of the cases is often rather apparent than real; we have distinctly found the germina of cancer in tissue, reputed healthy, surrounding a cancerous mass; and it is manifest that such germina, though invisible to the naked eye, may, quite as readily as a fragment of diseased tissue of even considerable size, act as the efficient agents of new development. When, independently of this mode of generation, the disease returns in the seat of its former growth, the occurrence must depend upon the continuance of that depraved state of the blood which is fitted to supply the necessary blastema, and likewise, possibly, upon some peculiar state of vessels of the part favouring its exudation here rather than elsewhere." (p. 121.) That the blood and blood-vessels are thus more or less concerned in the re-development of morbid growths may be admitted; but something, if not more, should be imputed to the depraved influence of the organic nerves supplying these vessels and the part affected. (See art. Cancer, § 26.)

92. In cases where the growth appears in one or more places remote from its primary seat, Dr. Walshe remarks that the occurrence, which is termed the "distant reproduction" of the growth, is explicable in two ways. "The newly discovered growth may have existed previously to the extirpation of the old one, and having simply acquired additional activity, so become obvious, after that extirpation; or the new growth may have really first appeared subsequently to the removal of the old one." The latter alternative Dr. Walshe believes to be rare. There is, however, reason to consider it to be more frequent than he admits; and to be produced not merely in

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* I have, in the foregoing pages, been much indebted to the work of Professor Bennett on "*Cancerous and Cancroid Growths;* but I have been nnable to adduce more than a part only of his researches. His numerous and interesting cases, his careful microscopic examinations, and his graphic illustrations, should not merely be perused, but carefully studied, by every physician and surgeon, in connection with his lucid descriptions of each kind of morbid growths, as exhibited in the pages of his very original and able work.

the way which he states, although that way certainly exists to a certain extent. Of this consecutive production of the morbid structure in distant parts, he considers the simple explanation to be that the vitiated state of the blood, proper for the supply of the necessary blastema, continues; and that this blastema is poured out in some other part of the frame, the original tumour no longer existing to attract its deposition within or around itself. That this explanation may hold good, either altogether or in part, I shall not here dispute; but the organic nervous influence, controlling, as it does, the functions of assimilation, nutrition, depuration, and excretion, certainly has a primary, and by no means a small, share throughout, in the distant reproduction and extension of cancerous and other tumours.

93. *D. The changes produced in tumours* during their evolution may be viewed as departures from the regular processes of their formation. The most important of these changes are their degeneration, which has been considered as regards cancer, and the removal or conversion of some of the non-cancroid, spontaneously, or by the aid of internal means. These, however, are only rare occurrences. Much more frequently morbid growths experience the principal diseased actions to which the natural or healthy structures are liable, as congestion, infiltrations of serum or of blood, hæmorrhage, inflammation, gangrene, depositions of matters foreign to their nature; and, as consequences of these, various discolorations and changes in consistence.

94. *E. The effects produced by tumours* and other morbid productions upon surrounding structures are most important, the injuries produced by them, in many instances, being chiefly of this kind. These effects are *mechanical* and *vital.* (WALSHE).—(*a.*) The *mechanical effects* are principally pressure, displacements, detrusion or extrusion, condensation, discoloration, infiltrations, interrupted circulation, occlusion of natural cavities or canals. When tumours form between muscular or moveable parts and the membrane covering these parts, they generally are detruded from the original seats of formation, and, as they increase, they present stalks or peduncles by which they are attached to these seats, as most commonly shown by tumours in the uterus, which, assuming this shape from detrusion, and often subsequently from extrusion beyond the cavity of the organ, have been improperly called polypus.

95. (*b.*) The *vital effects* of tumours on the surrounding tissues are softening or rarefaction, atrophy, hypertrophy, inflammation and its usual results, as adhesion, induration, ulceration, mortification, perforation; changes in the blood-vessels; hæmorrhages; alterations of the sensibility, from numbness to the most intense pain; and infiltration of the surrounding textures with matter similar to that composing the morbid growth — an effect observed chiefly in respect of cancerous tumours. Dr. WALSHE considers this last effect to occur in connection with no other growth except cancer, and to constitute one of the most evident distinctions between cancerous and other allied formations.

96. iii. THE SEATS OR LOCALIZATIONS OF TUMOURS AND MORBID FORMATIONS.—*A.* Certain tissues and organs are much more liable to be the seats of growths than others, more especially the cellular tissue, and the female sexual organs. Dr. WALSHE observes that, while cellular tissue is the favourite site of growths, fibrous textures but rarely afford them a nidus. The mammæ, the ovaries, and the uterus, are frequent sufferers; the lungs and brain are much more rarely affected. Certain parts of organs also are much more commonly attacked than other parts, as the pylorus and the epididymis, than the rest of the organs. Some organs, or parts of organs, are prone to be affected by certain growths in preference to others, as the mammæ, the stomach, the liver, &c. are most liable to be affected by cancerous productions; the bones to enchondroma; the neck of the uterus to cancer, in preference to the body of the organ, where fibrous tumours are chiefly developed; and the large intestines are very much more frequently the seat of cancer than the small.

97. *B. Sex* influences the site of growths. The female sexual organs are much more frequently their seats than the male organs; whilst the male urinary organs, especially the kidneys, are more frequently thus affected than the urinary organs of the female. *Age* has also considerable influence; certain epochs of life favouring the development of certain growths in preference to others. Some tumours often appear to be compatible, and others incompatible, with the co-existence of others. Dr. WALSHE remarks, that some growths, as cystoma and carcinoma, are sufficiently prone to appear in the same person; others, as fibroma and carcimona, are rare co-existences; none is actually incompatible, either as unconnected co-existences, or as developments in each other.

98. *C. The course* of tumours, or other morbid growths, topographically, is either *solitary*, *secondary*, or *multiplied.* — (*a.*) A tumour may remain solitary until the death of the person in whom it exists; no other organ or tissue than that in which it commenced being involved by similar disease. This occurs chiefly in respect of enchondroma, of cystoid tumours, and occasionally of fibrous growths.

(*b.*) *Secondary* growths arise by the spreading of the morbid structure from its original site to parts either *adjoining* or at a *distance.* — (1.) *Adjacent parts* are *secondarily* affected by infiltration or imbibition of the morbid matter from the site of preceding disease, a morbid mass thus gradually extending from the primary seat to circumjacent tissues, and co-ordinately enlarging. — (2.) Secondary growths in *distant parts* are produced by the transmission of the morbid matter by either the lymphatic or vascular systems. The matter, especially of cancerous and tuberculous growths, may sometimes be traced in the lymphatic vessels; and a lymphatic gland, in connection with a cancerous mass, not infrequently becomes cancerous also; and, although the morbid matter cannot always be detected in the communicating vessels, there can be slight reason to doubt this mode of transmission. These glands may, however, be secondarily attacked, independently of this transmission of the cancerous matter; but this can rarely be the case where the vessels proceed from the primary site to the secondarily affected glands, and, as transmission is demonstrated in some cases, it may occur in all. When parts far distant are secondarily affected, these parts manifesting no lymphatic connections, then it may be inferred that the secondary growth has either originated independently of the primary one, or been produced by the transmission of the morbid matter from it through the medium of the veins, in which cancerous as well as other morbid matters proceeding from the primary seats of disease have been detected. (See arts. ABSORPTION, and ABSCESS, SECONDARY.)

99. (*c.*) *Multiplied growths* may exist primarily and independently of the transmission by the lymphatics or veins of morbid matters from pre-existing growths. The disease in distant and unconnected parts results from the constitutional morbid condition which thus manifests itself in sundry situations. This circumstance is often observed in cancerous and tuberculous maladies, and in cases of fibrous growths; and of cancerous diseases, the encephaloid, or fungo-hæmatoid, the most frequently manifests a multiplied origin.

100. V. DIAGNOSIS OF SCIRRHOUS AND OTHER MORBID GROWTHS. — The most important point of this part of the subject, is the distinction between tumours or growths which are truly cancerous, and those which possess a different structure, although resembling the former. Histologists consider, that "the local symptoms, and the general signs observed in individual cases have been found insufficient; such as the lancinating pains, unequal surface, hardness, elastic feel, softening, ulceration, the surrounding tissue being affected, a general alteration of the constitution and return after excision" and have been, at various times, absent in cases undoubtedly cancerous, whilst they have existed in growths the nature of which is doubtful, and often been connected with epidermic, fibrous, fatty, or cystic tumours, of the most innocent nature. That this difficulty exists in rare cases, — that the symptoms and signs of cancer have been absent in truly cancerous diseases, and have existed in cases of an innocent nature, may be admitted to have occurred in rare instances; but these have not — at least rarely or never — furnished opportunities of examining the morbid growths microscopically until both diagnosis and treatment have been equally of no avail, or even until they have come under the knife of the anatomist. And even were opportunities of microscopic investigation afforded, it is manifest from what is above stated (§§ 5, 6.), and from what has been advanced by the ablest histologists, that the diagnosis is by no means easy, even by the aid of the microscope. But I shall allow Dr. BENNETT to state the case in favour of this instrument.

101. "Symptoms alone, however, from their very nature, are apt to mislead, caused as they are by a variety of disorders which may affect an organ; whilst physical signs, once established and ascertained, are in conjunction with those of universal value. The only physical proof we can arrive at of the existence of cancer is by means of the microscope; not that this instrument is in itself capable, even in the most expert hands, of doing any thing; but, conjoined with a knowledge of symptoms, progress of the case, form and appearance of the morbid growth, it offers us an additional and most valuable means of prosecuting our inquiries. It is from an union of these circumstances, combined with a minute examination of the growth, under such magnifying powers as will clearly display its cells and other primary elements, that we ought to found a diagnosis, and not from one or the other separately." — (p. 222.) It is evident, however, from the admissions of MÜLLER and others, and even from what has been stated by Professor BENNETT, that the microscopic history of morbid structures is only in its infancy; that there still remains much to be known respecting it; and that the connections subsisting between vital power, vascular action, and morbid growths — connections of the utmost importance to the physician, in a therapeutical point of view especially — have been generally overlooked; whilst there has been much difference in the information furnished by those who have professed themselves to be observers, gifted with the greatest powers of microscopic research.

102. *A. The diagnosis of cancer* by means of the microscope, as already stated (§§ 100, 101.), can seldom be determined until the disease has advanced so far as to become quite manifest without this aid. Dr. BENNETT remarks, that wherever we see, in a morbid growth, cells including other cells, there can be no doubt of its cancerous nature; and that it is not by fixing attention on any one particular cell that we can discover a marked difference between it and a variety of others, but when grouped together we observe in different cells a variety in size and shape, some containing one nucleus, others two or three, and rarely more, and the nucleus containing one or two nucleoli. Such a group of cells is distinguished, — 1st. From groups of epithelial cells; — 2d. From fibro-plastic cells; — 3d. From pus and plastic cells; — 4th. From compound granular cells; — and 5th. From fat-cells. The difference of the cancer-cells from cartilage-cells is also easily ascertained before softening, but after softening, the diagnosis is more difficult; but even in this latter case, the action of water and acetic acid on the cells, and an examination of different sections of the growth, will assist the diagnosis. In all cases, the situation and characters of the tumours, and the concomitant circumstances and symptoms should be taken into account. Open sores, the ulcers formed on the tongue, lips, or faces on the genitals and os uteri, furnish the best occasions for microscopic diagnosis during the life of the patient; and even in these situations many difficulties will often occur.

103. It is interesting to add what Professor WALSHE has stated respecting this important matter. "A constant and unfailing microscopical characteristic of cancer has hitherto been vainly sought for; the following propositions will serve as a commentary on, and, in some sort, a justification of, the statement. — (1.) Parent cells, containing within them sub-cells having darker nuclei, and these, in turn, bright nucleoli, are strongly characteristic of cancer; but such cells are rare in, and may be altogether absent from, scirrhus; encephaloid, in some phases of its growth, may also be without them. — (2.) The shapelessly caudate cell seems significant of cancer; but it may be absent from encephaloid, and it is excessively rare in scirrhus and colloid. — (3.) A tumour may present to the naked eye the characters of encephaloid, be the seat of interstitial hæmorrhage, affect the communicating lymphatic glands, run in all respects the course of cancer, and nevertheless contain no cells but such as are undistinguishable, in the present state of our knowledge, from common exudation cells. — (4.) Nay, more, while a primary 'malignant' tumour alone contains these cells,

the lymphatic glands secondarily affected may contain compound nucleated cells, spherical and shapelessly caudate. — (5.) The granular and imperfectly nucleated cell of scirrhus is valueless as an evidence of cancer. — (6.) The true fusiform cell is an adventitious formation when it occurs in cancer, and has no diagnostic signification. — (7.) The association of fibre and cell-structure, which will distinguish scirrhus from fibrous tumour, may be totally wanting in encephaloid; and it exists in sarcoma and enchondroma. — (8.) If fat be associated in large quantity with fibre and cell-structure, the certainty that cancer is present becomes great, but not absolute.

104. "The property of infiltration, which serves well to distinguish cancer *from other growths* nosologically, fails practically in the distinction of tumours generally, because a true cancer *is not necessarily* infiltrated, and because tubercle and exudation-matter may be infiltrated. In ultimate analysis the *single* character least likely to deceive is this: — if a tumour be cancerous it will yield on pressure an opaque, whitish (milky or creamy-looking), albuminous fluid; if it be not cancerous, it will not yield a fluid of these qualities." — (*Cycl. of Anat. and Physiol.* vol. iv. p. 137.)

105. *B. Fibro-nucleated tumours*, or growths, distinguished by the presence of fibres amongst which are infiltrated naked nuclei, have hitherto been confounded with sarcomatous, encephalomatous, or osteo-medullary tumours. LEBERT considers this to be a peculiar form of fibro-plastic growth. Dr. BENNETT has observed but three or four instances of this tumour, and has viewed them as possessing marked peculiarities in structure, although presenting most of the appearances of those growths with which this has been confounded.

106. *C. Epithelial growths* generally commence in an induration or wart upon the skin or mucous surfaces, and are harder in the former than on the latter. Occasionally they appear as cauliform excrescences or condylomata, made up of elongated papillæ aggregated together, with their summits more or less flattened. In this condition their diagnosis is easy. Sometimes they soften externally sooner or later after their formation, and become covered with crusts of inspissated pus and epithelium. "This crust on separation leaves an ulcerated surface, presenting irregular clefts between the hypertrophied papillæ, the edge being everted and the base and margins greatly indurated. The ulcer may slowly spread over a considerable portion of the surface, and cause great swelling of the lymphatic glands from the irritation produced. In this condition such ulcers are usually considered to be cancerous." But the progress of an ulcer commencing externally in warty excrescences, spreading laterally, slowly, and proceeding from without inwards, is distinctly opposed to the progress of true cancer, which almost invariably is deep-seated at its commencement, produces ulceration consecutively by thinning of the integument, and throws out subsequently and rapidly fungoid masses. The progress of the case, the absence of cancer-cells, the microscopic appearance of the projecting papillæ, will establish the nature of the growth.

107. *D. Fibrous formations* cannot, at an early stage, be distinguished from scirrhous. Dr. BENNETT considers, that at their commencement they are both identical, and remarks that experience is daily showing the truth of this statement; and that the distinctions between them insisted upon in surgical works are illusory. When a hard knot or induration follows a blow or injury, it may result from a simple exudation; but it may nevertheless become cancerous; although this conversion is much less likely to take place in a young than in a cachectic or aged person. When more advanced, fibrous tumours are distinguished, by partial elasticity, smoothness, and regularity of surface, from the irregular nodosities and stony hardness of scirrhus, and the pulpy feel of encephaloma. But these symptoms are sometimes deceptive. So that at an advanced, as well as at an early stage, the diagnosis may be occasionally impossible. Dr. BENNETT advises a cautious use of the exploring needle and microscopic examination. When the latter can be obtained, the presence or absence of cancer-cells will decide the question. But the former, however cautiously employed, will often aggravate the local mischief, and prove of questionable utility as respects the results.

108. *E. Cartilaginous growths*, when occurring in the extremities connected with the bones, and surrounded by an osseous capsule, may readily be distinguished from cancer; but when they are deep-seated, covered by soft parts, and have no distinct bony capsule, their detection is very difficult. Enchondroma may thus be readily confounded with cancer of the bones, of which disease it presents all the general symptoms and signs; and, as already stated (§§ 66, 67.), if it be softened it is not easily separated from cancer by the aid of the microscope, even after excision. In doubtful cases, during life, a microscopic examination can be obtained only by means of the exploring needle, and even then it may be unsatisfactory. The progress of the growth is more distinctive, cancer of the bones being generally more rapid in its progress than enchondroma.

109. *F. Fatty tumours.* — "Simple lipoma and most encysted fatty tumours are readily distinguished from cancer, the first by their lobulated, and the second by their rounded form, together with their doughy feel and non-attachment to surrounding parts." A fatty growth may, however, assume all the symptoms and signs of encephaloma. SEDILLOT excised a fatty tumour from a man aged forty-seven. The growth returned twice after removal, and was excised the third time. It was considered to be encephaloid, from the local and constitutional symptoms and its return; and yet, on a microscopic examination, it was shown to consist only of adipose and filamentous tissue; and a chemical analysis proved it be almost entirely composed of fat.

110. *G. Tubercular growths* can rarely be confounded with cancer. They simulate it only when the glands are enlarged in youth, and at an age when cancer scarcely ever attacks the frame, unless in the form of encephaloma, or fungohæmatoid cancer. "Undoubtedly many of the so-called cases of cancer in the young are softened tubercle. The nature of the growth may be suspected from its cheesy consistence and absence of cancerous juice; while the differences between tubercle and cancer corpuscles under the microscope are so great as to be unmistakeable. The only danger is confounding tubercle with the reticulum of cancer, which it closely resembles, and

is a mistake that a critical examination of all the concomitant circumstances will alone enable us to avoid." — (BENNETT, *Op. Cit.* p. 229.)

111. VI. PROGNOSIS OF SCIRRHOUS AND OTHER GROWTHS. — i. *Of scirrhous or cancerous formations.* — Little may be added at this place to what I have stated when treating of CANCER (§ 11. *et seq.*), and FUNGOID DISEASE (§ 17.). — *A.* MÜLLER considers that *growths which are truly cancerous* when extirpated invariably return, and are inevitably fatal. Dr. WALSHE observes, that "cancer is not, as a matter of absolute necessity, a fatal disease; but the number of recoveries is relatively so small that, practically speaking, they are almost without numerical value, and may be excluded from consideration." Professor BENNETT states, that he can no more agree with the modified statement of Dr. WALSHE than with the unqualified one of MÜLLER; and remarks, that the established recoveries may be small in number, but their numerical value is altogether unknown in the present state of science. He believes, that a cancerous growth is for some time purely local; that indolent tumours exist in a female breast or elsewhere for years, without making progress, or causing much inconvenience, and after a certain time they often suddenly increase, and evince signs of malignancy; that a fibrous vascular tumour may exist, in the filamentous meshes of which a cancerous exudation may be afterwards infiltrated; and that in this indolent state, a tumour may often be discussed by suitable means, and, if excised, be permanently eradicated. These propositions may be conceded to Dr. BENNETT; they have been long received as practical doctrines, and long acted upon by both physicians and surgeons. Even when a growth has become undoubtedly cancerous, complete excision of it has been said to have been successful in a few instances; but still the actually cancerous nature of the tumour has not been satisfactorily established, for the histologists argue that it has not been determined by a sufficient microscopic examination. But even they admit, as stated above (§§ 100, 101.), that a microscopic investigation is not sufficient always to determine the fact; so that the imperfections, which they impute to the infancy of the science, may be admitted to belong to the nature of the subject — to the varying, ever changing, and constitutional relations of these growths — to the alterations which take in them under the influence of changes in the state of vital endowment and of vascular action, both of the growths themselves, and of the body in which they occur as parasitic or other productions. t is in vain to look for precise marks of demarcation, either in the diagnosis or in the prognosis, where none exists, and where every phase, grade, and form of morbid growth is observed, although in different cases; each of which phases and forms are continually undergoing further changes, and assuming varying local and constitutional relations. The histologists, after all they have observed and written, leave the subject of prognosis, as well as that of diagnosis, pretty much in the state in which they found it; for one of the latest and best writers in this department has remarked, that "in the present state of our knowledge, there is no possibility of pronouncing accurately whether an operation will be successful or not." (p. 233.)

112. ii. *The prognosis of morbid growths which are not cancerous* depends chiefly upon their situation and nature, and has reference to the probability of removing them by medical treatment, or by surgical means. The growth may appear in a situation which precludes an operation, or in which an operation or simpler mechanical means would be extremely dangerous, and where a recourse to medicine in order to arrest its progress, or to remove it altogether should be tried or chiefly confided in, although the chances of success from it may appear small. Adipose or fatty tumours, tubercular growths, and glandular enlargements, admit of a more favourable prognosis than others, and furnish the greatest number of chances of their removal by medical treatment. Dr. BENNETT remarks, with reference to operations for the removal of tumours, that "it is now well understood that not only cancerous, but the most innocent growths may return after excision. It is generally supposed, however, that in all such cases the second growth originates in some germ which had been left in the part. Hence it is of great importance to separate a recurrence in the seat of the former tumour, from that occurring in other places and textures. The former is not necessarily to be dreaded. Numerous instances are on record of fatty, fibrous, and encysted growths returning again and again, and finally extirpated with success." Epithelial growths also occasionally return, but enchondroma, according to MÜLLER does not. It should, however, be recollected that whilst truly cancerous growths generally return either in the same situation or elsewhere, non-cancerous tumours seldom return, even in the same situations, unless a portion be left behind, and when they return, they appear not often in other parts. Warty and encysted growths, may occur in several places; several fibrous tumours may exist in the body of the uterus; and neuroma may affect several nerves. Although cancer, after a time, extends itself to the lymphatic glands in the neighbourhood, the affection of these glands is not to be received as a proof either of the cancerous nature of the primary growth, or of a fatal tendency of the malady; for a non-cancerous growth may cause, but much more rarely, enlargement of these glands, owing to the amount of local irritation produced by it. When, however, this affection of the glands occurs, it indicates, even in non-scirrhous tumours, a much more serious malady, than when no such glandular affection is observed.

113. VII. TREATMENT OF SCIRRHOUS AND OTHER TUMOURS. — i. *The Treatment of Scirrhous Growths* I have considered fully in the article on CANCER (§ 27. *et seq.*); but there are a few topics which have been agitated since that was written which require a brief notice at this place. The means which Dr. BENNETT advises for the "*retardation and resolution*" of cancer are *cold, dryness, pressure* and *locality*; and these he views as the principal known measures by which we can hope to retard the production and growth of cancer-cells. He remarks that "a cancerous growth is a vascular structure, which consists of nucleated cells infiltrated among a fibrous stroma, and that its power of growth, extension, and redevelopment is dependent upon the amount of cells it contains. It follows, that to retard the growth of the cancer-cell when once formed, is to retard the advance of cancer itself, and that to render it unproductive is to arrest its progress." This

view appears plausible at first sight; and the means proposed are to a certain extent appropriate to the pathological doctrine entertained. But it is questionable how far the doctrine is sound, and to what extent the means are beneficial. As to the former, if it be conceded, that the formation of cancer-cells are the results of a low grade of vitality in the part — that cancer-cells, like hydatidic formations, are parasitic productions, proceeding from low grades of vital power and of vascular action, and, like all such productions, consequences of these states, the treatment here advised has reference merely to the morbid results, and has comparatively but little regard to the antecedent vital conditions, of which the cancer-cells can be viewed only as the products. In this instance, as in many others, the histologists would induce us to grapple with the morbid product, to the total disregard of the vital condition producing that product — to the entire neglect of those states of vital power and vascular action, upon which all morbid growths depend, whether parasitic, hydatidic, cell-formations or simple exudations.

114. Viewing, therefore, cancerous productions or growths as depending upon the causes, constitutional and local, which I have set forth in the article CANCER (§ 26.), — entertaining the doctrine there stated, and knowing that it is supported by the ablest and most experienced writers and observers, as well as confirmed by my own experience, I firmly adhere to this doctrine, and to the *intentions of cure* set forth conformably with it in that article (§ 40. *et seq.*), believing that they are the best calculated to enable the constitution to resist the inroads of the malady, to prolong life, and to give the patient a chance of throwing off, or resolving the local evil. The measures which have more recently been advised should not, however, be passed over without notice, although but little evidence of benefit from them has hitherto been obtained. Dr. BENNETT observes, that "all eggs and young animals require warmth to favour their growth, and maturity is reached earlier in the tropics than in temperate regions. In the same manner, excessive cold, dryness, want of room, and unfavourable position, are circumstances hostile to cell-development. But it requires no lengthy argument to prove the great influence of these agents on vital growth." Without disregarding this view of the subject, I would still insist upon the importance of the principle for which I have contended, both in the article CANCER (§ 26.), and in that in HYDATIDS (§ 24.), that these and all other parasitic formations encrease and multiply in proportion as the parent animal becomes weakened, and as the secretions and excretions accumulate, and that those formations are most disposed to diminish and ultimately to disappear, with the full restoration of the vital power, and with the healthy nutrition of the animal which produced them.

115. *A. Cold.* — Dr. BENNETT remarks respecting this agent, that "in a cancerous growth, the tendency of which is to excessive cell-formation, we evidently retard its advancement by the application of cold. Were it possible, indeed, to bring down the temperature of an entire growth below the vegetating point we must inevitably kill it; but, supplied as it is with heat through the warm blood within, this is impracticable. Still the external application of cold is one of the most powerful means we possess of retarding the progress of a cancerous or any other kind of growth." The beneficial agency of cold has, however, to be proved. If it be employed so as to promote and develop organic nervous energy and vital power, there can be no doubt of its proving more or less useful.

116. *B. Dryness.* — It has been supposed that, as the development of cell-formations depends upon a blastema or nourishing fluid, it follows, that, if this were cut off, the growth would die. In order to accomplish this intention, it would be necessary to tie the principal vessels nourishing the growth. This has been done by MAGENDIE, JOBERT, and HOSSACK, with partial success in some instances and with complete success in others: but it is doubtful whether or no the disease was cancerous in all the cases. Dr. HOSSACK applied a ligature on the carotid artery in two cases of scirrhus of the parotid gland. In one case the growth of the tumour was arrested, and the suffering of the patient relieved: in the other a complete cure was produced. Lotions and humid applications should be avoided, and those which produce a drying or absorbent, with an astringent, action ought to be preferred.

117. *C. Pressure* was first advised by YOUNG, and has since been adopted for the cure of CANCER (see § 37.) by several writers. Pressure acts, 1st, by diminishing the supply of fluids to the morbid growth; 2dly, by preventing the expansion and development of the cancer-cells; and, 3dly, by promoting the disintegration and absorption of the morbid growth. Dr. BENNETT remarks, that "pressure applied externally to so-called cancerous tumours has been pretty extensively tried, and been found successful, sometimes in retarding, and at others in altogether removing them." TRAVERS has seen cases of this kind; and RECAMIER gives the following results of the practice tried in 100 cases. He says, of these, "sixteen appeared to be incurable, and underwent only a palliative treatment. Thirty were completely cured by compression alone, and twenty-one derived considerable benefit from it: fifteen were radically cured by extirpation alone, or chiefly by extirpation and pressure combined; and six by compression and cauterisation. In the thirteen remaining cases the disease resisted all the means employed." Dr. WALSHE states that Dr. A. R. J. BAYLE, out of 127 recorded cases, gives 71 cured, 26 improved, and 30 unaffected. These results are certainly much more favourable than could have been obtained from the treatment of the several kinds of scirrho-cancer; and I would therefore infer, either that the favourable results have been prematurely reported, or that cases actually not cancerous have been confounded with the cancerous.

118. Dr. NEIL ARNOTT has greatly facilitated the employment of pressure by the invention of an instrument for this purpose; and which has been described by Dr. Walshe. It consists of a spring, an air-cushion, supported by a flat resisting frame or shield, a pad and two belts. It does not interfere with the movements of the thorax, and the amount of pressure can be nicely regulated and equably applied; causing great relief from pain, and restraining hemorrhage in ulcerated cases. It has proved useful in cases in which

I have seen it resorted to. Dr. BENNETT remarks, that, if pressure alone be capable of producing such good results, its conjunction with one or more of the other means capable of retarding growth may be attended by even greater utility; and thus the apparatus invented by Dr. J. ARNOTT, by means of which pressure may be combined with external cold and dryness, is directly indicated, and deserves to be tried; or his apparatus, applied when the patient is at rest, may be alternated with that of Dr. NEIL ARNOTT when exercise is desirable. I believe, however, that pressure will be found most efficacious when conjoined with those measures which are the best calculated to improve the general health, and to enable the vital power to throw off the parasitic formation. (See art. CANCER, § 40. *et seq.*)

119. *D. Locality* has been shown, in the article CANCER, to have considerable influence in favouring the development of this malady. Cold, humid and malarious situations, unwholesome food, insufficient nourishment, and mental anxieties and depression, are amongst the most influential causes of scirrho-cancer. Therefore a choice of locality, and with reference to season, prevailing winds, and exposure, should be made with due care; a dry, moderately warm and bracing situation and air being selected. A clay soil, or a low alluvial, wet, and swampy soil should be avoided, even to a considerable distance; and food, exercise, and the regimen of both the body and mind should be such as are most calculated to give due tone to the former, to refresh and agreeably engage the latter; interesting occupations being calculated to promote both intentions, whilst the want of occupation leaves the patient a prey to ennui and to his own depressing anticipations, or his still more lowering fears.

120. *E. Excision.* — The propriety of excising tumours, from a belief in their cancerous nature, or dread of their assuming this nature, or as the best mode of removing them, has been much discussed by both physicians and surgeons, especially in recent times. It may have been supposed that the discoveries of the histologists would have gone far to determine the question of excision, in as far as the nature of the growth may be concerned. But they have left the matter pretty much in the same state as that in which they found it. Professor BENNETT, after alluding to the discussion on this subject, and the differences of opinion expressed by the most eminent surgeons of Paris, remarks that "a knowledge of the structure and natural progress of cancerous and cancroid growths must in future exempt surgeons from the doubt and difficulty they formerly experienced. At the same time it cannot be denied that considerable obscurity still hangs over our knowledge of the pathology of cancer, and that there are no means of diagnosing a cancerous from fibrous and other forms of cancroid growth at their commencement. It seems to me certain that a cancerous may supervene upon a cancroid growth, and that both for a time may be local, so that, under all circumstances, where the nature of the tumour is doubtful, after means of retardation and resolution have had a fair trial, excision should be at once had recourse to. As there is no possibility at an early period of knowing whether the growth may or may not ultimately become cancerous, prudence demands that *as soon as it becomes evident that these means have failed to arrest its progress*, an operation should be performed. If *early* excision were more practised, many of the lamentable cases which occur would never appear." (*Op. Cit.* p. 242.) This is sound advice; and the same eminent physician further remarks: "The practical rule, then, which pathology and experience unite in causing us to adopt, seems to be this, *that so long as cancer remains fixed in a part which is capable of being removed, and the strength of the patient is not too much reduced, so long is the surgeon warranted to interfere.* If this applies to cancerous, it does with tenfold force to cancroid growths, which, every thing that we know, warrants us in asserting, are much less fatal and malignant." (*Op. Cit.*, p. 245.)

121. *F. Chemical applications, &c.*—The destruction of morbid growths by various cauterising or dissolving applications, can scarcely be accomplished unless at very early periods of their production; and, as regards cancerous formations, these applications would increase rather than arrest the disease. Dr. BENNETT remarks, that "Acetic acid dissolves the cell-wall more or less, and strong potash reduces the whole to a granular mass. The continued application of these agents, therefore, would tend to dissolve if brought in direct contact with the cells, and need not necessarily excite such irritation as to cause fresh exudation. The only objection is, the utter impossibility of affecting the whole mass, even in cases of ulceration, and preventing the formation of deep-seated cells, while the superficial ones are destroyed. In certain cancroid growths, especially epithelial ones, the application of acetic acid is an established remedy, and should always be tried when it is thought possible to bring the fluid successively in contact with the entire mass of the disease." (p. 250.) The external application of the chloride of zinc has been advised, and of iodine, and of several of its preparations. Probably the application of an iodide of zinc may deserve a trial.

122. *G. Internal Remedies.* — Before excision is attempted, and often contemporaneously with a judicious recourse to external means, several internal remedies, either singly or variously conjoined, may be tried, more especially those which tend to promote the digestive, assimilative, and depurative functions, and to develop the powers of life. As respects cancerous growths, this principle of treatment has been fully insisted on (see arts. CANCER, § 40. and FUNGOID DISEASE, § 21.), it therefore only remains briefly to notice the importance of adopting it in our attempts to remove other morbid growths, especially before the constitution is subjected to the shock of an operation; and in cases where the situation of a tumour or other circumstances may render the success of an operation either extremely improbable or impossible. In three cases of large tumours, — one seated superficially, evidently a fatty tumour, and about the size of a person's head, the others seated very deeply amongst the muscles of the upper half of the thigh, — and in one case of tumour, apparently attached to the pericranium, a course of internal medicines entirely removed the disease. I had advised a recourse to surgical aid, but the patients having been desirous of trying medical treatment before any surgical means were adopted, a course of the medicines about to be

mentioned was prescribed, very nearly the same substances having been employed for the four cases. Those cases occurred some years ago; but the persons who were the subjects of them had not, up to recent periods, experienced a return of these growths. The medicines which were prescribed consisted chiefly of the Iodide of potassium, conjoined with solution of potash, the decoction or compound tincture of cinchona, the internal use of tar-water, and the fluid extract or other preparations of sarsaparilla, with due attention to diet and to exercise in the open air. When treating of CANCER (§§ 34—41.), the propriety of prescribing the preparations of *iron* was insisted upon, especially in such combinations as the peculiarities of the case would suggest; and the *iodide of iron* was then for the first time recommended in the treatment of cancerous diseases. This medicine has frequently been given by me in these maladies with sarsaparilla, or dissolved in the syrup of sarza with more or less benefit; and the *nitro-hydrochloric acids* have been sometimes prescribed with vegetable tonics, or bitter infusions. Considerable advantage has been derived, in several cases, from the use of inspissated *ox-gall*, as recommended in the first part of this work, and prescribed in numerous and varied formulæ in the APPENDIX which accompanied that part, more especially in correcting and promoting the functions of the digestive canal. *Conium*, and other narcotics, formerly much praised for cancerous maladies, have rarely proved of advantage beyond the temporary relief to pain, or to other urgent symptoms they have sometimes afforded.

123. *H. Diet and Regimen.*— These require to be adapted to the temperament, diathesis, habit of body, and other circumstances of the patient, as well as to the presumed nature of the tumour. When treating of CANCER (§ 44.) I mentioned the advantages generally derived from attention to the secretions and excretions, and from promotion of the primary and secondary assimilating processes. There can be no doubt of the good effects of moderate exercise in the open air, of a residence in a mild dry atmosphere, and of pleasant occupations, with a cheerful state of mind. But the nature of the food admits of much more discussion. In the cancerous or scirrhous forms of morbid growth, the adoption of a farinaceous and vegetable diet has been advised by Dr. LAMBE and a few others. I have seen this diet most beneficial in a case which was considered cancerous disease of the os and cervix uteri; but the patient enjoyed at the same time the advantages of removal to a good air; and her sanguine temperament and full habit of body favoured the change of diet. When, however, the patient is of the melancholic, lymphatic, or nervous temperature, or if anæmia or a cachectic habit of body be manifest, I believe that a judicious combination of animal with vegetable food, and the promotion of the assimilating and excreting functions, are most beneficial. In all cases of a malignant or contaminating nature, and in all cases which are likely to assume this nature, the chief indication of treatment is to enable the vital energy, by the aid of diet, air, and exercise, to resist the extension of the local evil, and to favour its transformation or resolution.

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SCROFULA AND TUBERCLES.

— SYNON. — *Struma*, Celsus, Pliny, Linnæus, Good; — *Scrophula* (from Scropha or Scrofa, a pig or sow), Sauvages, Vogel, Sagar, Cullen, Macbride, Darwin, Young; — *χοιρὰς*, Hippocrates; — *Scrophulæ*, Pinel; — *Scrophulosis, Scrophulosus Morbus, Vitium Scrophulosum*, Dunglison, — *Cachexia Scrofulosa, Adenosis Scrofulosa*; — *Glandes, Strumes, Ecrouelles,* (*Cruels*, Scotticè) Fr. — *Kropf, Skropheln, Skrofelkrankheit*, Germ. — *Scrofula, Scrofole*, Ital. — *Scrofula, the King's Evil, the Evil.* — *External Scrofula or Struma.*

TUBERCLES. — *Tuberculum*, (from tuber, a tumour); *Tuberculosis, Morbus tuberculosus, Strumosis*, — *Cachexia tuberculosa, Dyscrasia tuberculosa*, — *Diathesis seu Constitutio Strumosa; Tubercular or tuberculous Cachexy, Diathesis, or Vice, &c.* — *Internal Scrofula or Struma.*

CLASSIF.—3d *Class*, Cachectic Diseases:— 3d *Order*, Impetiginous Affections (*Cullen*): — 3d *Class*, Diseases of the Sanguineous function:—4th *Order*, Cachexies, (*Good*): — CLASS IV. ORDER I. (*Author in Preface.*)

1. DEFINIT. — *Constitutional asthenia; a weak or an atonic development of the frame, with a flabby state of the soft solids and predominance of cellular and lymphatic conformation; and a disposition to, or the presence of, swellings of the lymphatic glands, of disorder of the mucous surfaces, and of deposits, in various organs or parts, of small masses, varying in size, consisting of a firm, friable, inelastic substance resembling cheese, and denominated tubercles.*

2. From the *synonymes* enumerated above, it may be inferred that the terms *Scrofulous diathesis*, or *cachexy*, or *vice; Strumous taint* or *constitution; Tuberculous cachexy* or *evil, Tuberculosis, Scrofulosis*, may be considered as nearly synonymous, although the scrofulous taint or cachexy may be viewed as sometimes existing without the tubercular deposit being yet formed, this deposit, in some one or more of its numerous seats or manifestations, being the common structural change resulting from this taint — resulting so generally as to render it doubtful whether or not this taint ever exists without the tubercular formation being present in some situation or other, either in a developed or in a rudimental and latent form. *Scrofulosis* and *Tuberculosis* will, therefore, be considered by me as nearly synonymous — as very nearly allied, if not identical morbid conditions; the former, however, being more frequently applied to the *external* manifestations of the constitutional taint or diathesis, the latter more generally to the *internal* structural changes. I am aware that this opinion is different from that supported by SCHÖNLEIN, SCHARLAN, DR. EVANS, MR. PHILLIPS, and M. LEGRAND; but I believe that their doctrine will, in this respect, be considered incorrect, after the consideration which will be given to it in the sequel. In discussing the subject of *Scrofula* and *Tubercules* I shall follow this arrangement: —

3. i. *Of the Scrofulous diathesis or taint — Latent or inactive Scrofula:* — ii. *The Causes of*

Scrofula and Tubercles: — iii. *The Structure and Composition of Tubercles:* — iv. *The Pathology of developed, open or manifest Scrofula and Tuberculosis:* — v. *The Pathogenesis of Tubercles:* — vi. *The Comparative Pathology of Tubercle:* — vii. *The Scrofulous Taint as predisposing to, and influencing the symptoms, course and Terminations of various diseases:*—viii. *Diseases attack the Scrofulous diathesis, without being essentially scrofulous or tubercular, although more or less nearly allied to Scrofula:* — ix. *The associated alterations and complications of Scrofula and Tuberculosis:* — x. *The Prevention of Scrofula and Tubercles:* — xi. *The Treatment of Scrofula and Tubercles.*

4. I. INDICATIONS OF THE SCROFULOUS DIATHESIS OR TAINT.—The *Strumous* or *scrofulous taint* was no further recognised by the ancients than in connection with swollen external or lymphatic glands, the constitutional vice being overlooked until the writings of FERNEL, PLATER, BAILLOU, and others, directed attention to a more correct pathology of the disease. More recently numerous writers have furnished interesting information respecting Strumous affections, especially HOFFMANN, HUBER, VAN SWIETEN, LALOUETTE, HUFELAND, and HECKER; and, in the present day, the writings of CARSWELL, GLOVER, PHILLIPS, BENNETT, WALSHE, TYLER SMITH, and others, are especially deserving an attentive perusal. Dr. GLOVER very justly remarks that "a careful distinction should be made between the scrofulous diathesis, or predisposing constitution, and the actual processes of the disease, — between the *Ens in potentia* and the *Ens in actu.*" The scrofulous diathesis may, by the debility or the susceptibility accompanying it, predispose to other diseases besides those which are more strictly strumous or tuberculous; and a distinction should therefore be drawn between the latent or inactive scrofulous taint, the diseases which are not strictly attributable to this taint, and those maladies which are actually the structural manifestations of it. But is this distinction readily drawn? I believe not; and that the descriptions and distinctions adduced by HUFELAND, LLOYD, LUGOL, and many others, are so loose, and present so numerous exceptions, that they deserve, in many particulars, but little credence, and certainly some of them at least require a more particular investigation. Several of these have been subjected to a minute examination by Mr. PHILLIPS; but, as he considers tubercles to be distinct from scrofula, much of his reasoning on this subject fails in strictness of application to the subject in the wider signification which I have assigned to scrofula. M. LUGOL assigns so many indications of the scrofulous diathesis, and those with so little justice and precision, as to have it remarked, that, of all his characters of this diathesis, there is not one which may not, with equal value, be replaced by a phenomenon diametrically opposed to it; yet this is one of the writers who is so much praised by the Gallic school in this country. Of the various indications of the scrofulous taint enumerated by this and other writers, many will appear to the experienced writer as possessed of little signification and dependence, and as deserving of very slight consideration.

5. *The chief characters of the scrofulous taint* enumerated by writers are the following: — (*a.*) A want of due bodily symmetry; small, weak, or crooked limbs; a gibbous or pigeon breast and flattened ribs; hare lip (BREDOW); hypertrophy of the pubis, the sacrum and the ischia (LUGOL): — (*b.*) A certain character of the head and face: the jaws are said to be broad, the forehead low and angular, and the neck long and rounded; a head larger than natural, especially posteriorly; a puffed up rounded visage; great transparency or whiteness of the skin, often with a rosy-tint of the cheeks; "a pale, inflated countenance; the chief colour of the dark complexion is dull or dirty, of the fair an unnatural whiteness, frequently with an agreeable redness of the cheeks; in others a waxy yellowness, with a dirty pallor round the mouth." (BREDOW.) Bluish rings round the eyes; the eyes most frequently large, oftener blue than dark; the pupils are commonly large; the tunica albuginea of a pearly whiteness, traversed by injected blood vessels, especially if the mesenteric glands are affected (HUFELAND), or of a bluish whiteness, and the pupils large when the lungs are diseased. The eyelids are often œdematous, the eyelashes are long, the Meibomian secretion is increased. The nose is wide or swollen, or red or shining; the upper lip is thick and projecting, and the furrow between it and the nose is deep. The general expression of the countenance indicates indolence and want of energy. The first teeth are small and subject to caries. The second are broad, often covered by a glairy secretion, are very white, readily split, and often become carious.

6. (*c.*) The appetite is irregular — sometimes impaired, at other times voracious; occasionally there is nausea; the tongue is often foul, the breath fœtid or sour; the bowels are irregular; flatulent eructations are frequent and acid; and the excretions are also acid. The abdomen is large, tumid and flatulent on percussion. Discharges from the nose are common, and from the vagina not unfrequent. The soft solids are flabby; the adipose and cellular tissues abundant but soft, giving the surface of the body a full and rounded contour; the limbs are deficient in rigidity and firmness. The tendons are small and yielding; the capsules of the joints are weak; and the heads of the long bones are large. Hence a disposition to lateral curvatures of the spine, thick ancles and joints, large ill-formed hands and feet, and falling of the arches of the latter. The shoulders are high.

7. (*d.*) According to HEUSINGER, one of the correctest writers on Pathology, the strumous taint consists of a torpid state of the nervous system. The *blood*, whose condition is yet but little known, appears to be, from the commencement, poor in globulin and hæmatin, rich in albumen, which, at a later period only, diminishes also. There are abundance of lymph, extension of the lymphatic vessels, marked development of the lymphatic glands, and predominance of the cellular system, not only under the skin, but in all the organs, where it commences to replace the specific tissues, which is especially apparent in the muscles, the bones, &c. All the mucous secretions are augmented, and they often become albuminous.

8. (*e.*) General lassitude, languor, and debility are commonly experienced, with an inability to sustain prolonged physical and intellectual exertion. The powers of the mind, although generally feeble, are often precocious. DR. GLOVER

remarks that, in very few of the subjects which he had examined, has he found the bodily or intellectual powers fairly developed in a degree proportionate to the age and circumstances of the patient; and that a general retardation of development seems one of the most constant features of this peculiarity of constitution. According to HUFELAND and FISCHER the generative functions are early and powerfully manifested. They may be early and frequently, but certainly not powerfully exerted. LUGOL maintains that these functions in scrofulous subjects are below the average.

9. (*f.*) All that is known of the *Blood* of scrofulous persons has already been stated (§ 7.). The *Urine* has been described by SIMON and others to be usually very pale, unless vascular excitement be present. Its specific gravity is low, and in children it is more acid than usual. There are differences of opinion as to the nature of the free acid; some consider it phosphoric acid, others hydrochloric acid, and others, again, lactic acid. The urea and uric acid are often diminished, whilst the salts, especially the phosphates, are increased; and even oxalic acid — an acid foreign to normal urine — has been found in the urine of strumous children. According to SCHÖNLEIN the chief alterations observable in the urine of scrofulous persons consist in the diminution of nitrogenous constituents — the urea and uric acid; and in the appearance of the non-nitrogenous oxalic acid, and more rarely of Benzoic acid. The acids are frequently so abundant that the urine, upon cooling, deposits copious sediments of the oxalates, and these sediments sometimes form renal and vesical calculi. The frequent occurrence of oxalate of lime or mulberry calculus in children is well known.

10. (*g.*) The observations of Mr. PHILLIPS on the characteristics usually assigned to the scrofulous taint are not devoid of interest, although open to the objection already noticed (§ 4.). He states that, in many "instances, most of the alleged characteristics of the scrofulous constitution may distinctly exist, whilst no strumous deposit takes place, and in others, diseases ascribed to the strumous habit may take place in persons in whom the marks alluded to cannot be recognised." In addition, however, to most of the indications which have been enumerated, Mr. PHILLIPS notices others, which characterise also this diathesis, namely, a want of muscular development; an hypertrophied or infiltrated condition of the cellular tissue, which rapidly disappears under privation or disease; a pallor and coldness of the surface, owing to a feeble circulation; a marked disposition to disorders of the respiratory and digestive mucous surfaces; frequent soreness of, or discharges from, the nose, the eyes, and the ears; enlargement of the tonsils; the frequent dryness of the skin, or a greasy, sour, or fœtid exhalation from the skin; and more or less disorder of nearly all the abdominal secretions and excretions.

11. (*h.*) The colour of the hair is very variable; but for the most part it inclines, according to Mr. PHILLIPS, to a dark tint. Of nearly 9000 scrofulous children he found a little over 32 per cent. had light hair and eyes. BARTHEZ and RILLIET state that, of 314 tuberculous children, the hair was fair in 150, red in 4, chesnut in 71, black or dark in 40, and not observed in 49. Dr. GLOVER remarked that, in 126 cases, 86 had fair hair and eyes, and 40 were of a dark complexion; and that in some workhouses, 97 cases had a light, and 47 a decidedly dark complexion. Mr. PHILLIPS remarks, that "the alæ nasi may be broad, but for the most part they are not so. The upper lip or even both may be tumid, but in the majority of cases they are not so. There is not, as some have supposed, any thing constant in the shape of the lower jaw, or in the appearance of the teeth." He observes that the scalp and other parts of the integuments are often the seat of eruptive affections.

12. (*i.*) It is obvious from the above, that the strumous diathesis may be viewed as an original or an acquired deterioration of the constitution from the natural healthy pitch or condition, — and that, before any actual manifestation of disease takes place, there may long exist such a state of organic nervous power, of circulation, of function, and of nutrition, — of general asthenia, and of deficient structural development, as to constitute an obvious and wide divergence from health, before the scrofulous formation or tuberculous deposit takes place, — and, moreover, that the characters now described, as constituting the scrofulous taint, cachexy, or divergence from the actual healthy condition, may exist for many years, or throughout a long life, without being followed by any of the marked structural manifestations of strumous disease or tuberculous deposit, although many determining or concurring causes very easily develop these diseases, in very active and manifest forms.

13. II. OF THE CAUSES OF THE STRUMOUS TAINT AND OF EXTERNAL AND INTERNAL TUBERCULOSIS.— The *Causes* of scrofula have been investigated with much assiduity by Mr. PHILLIPS, but chiefly with reference to the external forms of scrofula, and, as observed, in young subjects. The limitation which he has assigned to the disease — the exclusion from his calculation of the tubercular or more internal states of struma — impairs or even altogether destroys the value that he has assigned to each of the causes he has investigated; and therefore they must be estimated either with reference to this limitation, or more loosely in the extended acceptation in which I have received the term. Mr. PHILLIPS remarks that "hereditary influence, syphilis, bad air, bad food, and a cold and damp atmosphere, are the causes to which have been most frequently assigned the production of scrofula. The error of each theory is its exclusiveness; and when we reflect upon the difficulty of estimating the unmixed influence of any single cause, and when it is made probable that many causes are in action, we can scarcely comprehend how it happens that able enquirers should maintain, with so much pertinacity, not alone the efficiency but also the universality of one." When describing the *ætiology of* DISEASE (see §§ 7—62. of that art.) the combined, the concurrent, and the determining operations of several causes were insisted upon in the production of the morbid effect; and this associated action has been duly recognised in the causation of most diseases, the one now under consideration certainly being no exception. The difficulty of estimating the influence of any one of the several causes which usually co-operate in producing a disease is certainly great, and is owing

to circumstances which are more or less obvious. It has been attempted by certain writers to confer an arithmetical value on each particular cause, and the attempt has been followed by some in this country. But the nature of the subject, the varying influences of seasons, weather, localities, social and moral conditions, and numerous concurring and intercurrent agencies, render such precision unattainable, even if the requisite data, at given periods, could be obtained with due certainty; the attempts which have hitherto been made being characterised by more manifest errors than have distinguished even the loosest descriptions of much less ambitious writers.

14. The author now mentioned justly observes, that the difficulty of estimating "the force of any of the so-called causes of scrofula is owing to the fact, that the opportunity of observing a single agent in action alone is very rarely afforded: where one cause exists another is, almost certainly, intimately associated with it; and to assign to each its proper influence is rarely possible. This is particularly the case with bad food, bad air, and bad clothing; the existence of the one almost implies the presence of another." Nevertheless the attempt to estimate aright the influence of individual causes should not be neglected, when it can be made with a reasonable hope of success. And that it may be made with success, the following instances will show: — 1st. In a large charity school, of considerably above 100 girls, cases of scrofula became remarkably prevalent, notwithstanding a sufficient supply of wholesome food and clothing, and attention to ventilation, and treatment produced no benefit. During my duties as a visiting trustee, I ascertained, that the wooden floors of the sleeping and other apartments of the institution were washed daily. I contended, in the committee managing the charity, that this was the cause of the disease, and advised dry-rubbing; and that washing the floors should be adopted only on requisite occasions. This advice was followed, and the cases under treatment soon recovered, and no new case occurred. 2d. In a large school of boys, scrofula, both external and internal (tubercular), was of frequent occurrence, several of the parents having removed their children, not unfrequently during advanced or incipient tubercular disease. Having been sent to one of the children, I could find no fault with the food and exercise of the pupils, nor with the beds and cleanness of the apartments. But the sleeping apartments were much too close — too crowded and ill ventilated. Upon the removal of the cause, the school became remarkably healthy. Now, in these instances, the causes just named could not be disputed as having been the most active; most probably, however, various predisposing causes having existed, especially hereditary constitution, as respected the individuals affected.

15. The *causes of scrofula* have been variously arranged by writers. Some have viewed them as *predisposing* and *exciting*, others as *hereditary* and *occasional*. I shall notice, 1st. *Those which depend upon one or both parents;* and, 2d. *Those which change the constitution of the individual, especially during childhood, and which are independent of the constitution of the parent;* both classes of causes often concurring to produce one or other of the morbid results, usually termed scrofulous, strumous, or tubercular, — or external or internal scrofula.

16. i. CAUSES APPERTAINING TO ONE OR BOTH PARENTS. — *A. Hereditary constitution or Predisposition.* The operation of this cause has been much over-estimated by LUGOL, and many other writers, and as much underrated by LOUIS, HENNING, BAUDELOCQUE, PHILLIPS, and others. The circumstances which chiefly occasion this difference of opinion are the confounding of hereditary and congenital transmission of the disease with hereditary diathesis or constitution, and inattention to the fact that the parent or parents, who possess only the latent diathesis, may have children with the external signs of the disease in childhood, or with tubercular or internal scrofula at any future period of life, or with both manifestations of the disease; or that a parent affected with either the one or the other may have children presenting no indication of the malady, beyond the latent diathesis, which, however, may be very obscure, or altogether absent, or may have an offspring affected by a different form of the disease from that of the parent. Let any observer of experience refer to what must be familiar to him, and he will find, what I have often remarked, that one parent possessed of the scrofulous diathesis has passed on to the age of sixty or upwards, and has at last died of tubercular consumption, the other parent being of a sound and strong constitution, and either one or more of the offspring have had forms of external scrofula, before puberty, or have grown up and been carried off by phthisis in after life; or have been affected both before and after puberty — some with external, some with internal scrofula. I have known many such occurrences, and even instances where the scrofulous diathesis, either latent or manifested by active disease, existed only in one parent, and yet, of numerous families, part died in early life, with external signs of scrofula, as well as internal disease, and the rest, or the majority of the survivors, became consumptive at various ages, more or less advanced. Now, Mr. PHILLIPS and other writers, who consider tubercles a distinct lesion from scrofula, keep out of their calculations the former, and consider the one to have no hereditary connection with the other — a position which is altogether overturned by the numerous facts which are identical with the statement I have now made, the faithfulness of which is open to the investigation of every observer.

17. It is unnecessary for me to enumerate the authorities who have contended for the hereditary character of scrofula and tubercles — for the possession by the offspring of the diathesis or constitution of the parent or parents, more or less, or in one or more instances, and therewith the disposition to the same disease to which the latter was most liable. But, without regard to authority, let the matter be made one of observation, respecting which common sense is sufficient to judge. Mr. PHILLIPS remarks, that after reading the essay of PORTAL on "Hereditary diseases," he rose up in doubt, whether, in the strict sense in which alone he thinks the question should be regarded, there be clear evidence that almost any disease is hereditary, though with respect to syphilis and small-pox the proof may be sufficient. Certainly much of the difference of opinion respecting the hereditary nature of diseases

depends upon the signification assigned to the term. No one at the present day considers that the offspring is born with the disease which afflicted the parent, although even this is the case in rare instances; but only that the constitution or diathesis is inherited, and with it the disposition to the same diseases which attended it in the parent or parents. This subject is, however, sufficiently discussed in the article DISEASE (see § 11. *et seq.*).

18. (*a.*) *May the parent transmit scrofula or tubercles to the fœtus?* — Scrofulous tumours and tubercles have been observed in the fœtus and in very young infants by DUPUY, ANDRAL, CHAUSSIER, BILLARD, and a few others. The instances in which they have been found are few, and the connection of these cases with disease of the parents has not been shown in the majority of them. In three instances, in which the mothers died of consumption very soon after delivery, I found the lungs of the infants studded with tubercles, in the first stage, a few having advanced to the second stage. The infants were remarkably emaciated, had cough very soon after they were born, and died in a few days. In these three instances, tubercles of the lungs of the fœtus were expected during the gestation of the parent, by the practitioners in attendance (Mr. NICOLSON and Mr. WINSTONE), as well as by myself, and in each case the mother considered the child to have been born with the same disease as that with which she was afflicted.

19. (*b.*) *To what extent may scrofula and tubercles be viewed as hereditary?*—The statistical or numerical writers on this subject have mystified and misled many who pin their faith to authority and numbers, without inquiring into the data upon which their calculations are based, or into the meaning of the terms they employ. One of the most recent numerical pathologists, having defined and limited scrofula to be "enlarged cervical glands discovered by the touch or sight, sinuses or ulcers succeeding to such glands, scrofulous bones or joints, or the consequences of them;" and at another place having further limited his definition to "disease of subcutaneous lymphatic glands," gives the results of his examinations of 7587 children, and found nearly 23 per cent. of these bearing such marks of scrofula. He further ascertained that, of 2021 children whose parents were both *untainted*, 21 per cent. presented marks of scrofula; that of 1092 children, whose parents were both *tainted*, nearly 25 per cent. presented marks of scrofula; that of 2107 children whose father only was scrofulous, nearly 23 per cent. had marks of the disease; and that of 2367 children, whose mother bore the marks of scrofula, whilst the father did not, nearly 24 per cent. presented signs of the distemper. Thus all that statistics here furnishes in favour of the hereditary influence of the scrofulous diathesis, is not quite 4 per cent.; and many believing in the precision and truth of numbers, would consider the evidence here adduced as most conclusive and incontrovertible. But, of the children thus examined — their ages probably being from two to sixteen years — the lymphatic glands may have been enlarged, and returned to their healthy state before the examination was made, or either these glands or some other parts may have presented evidence of scrofulous change *after* the period of this examination; and taking the more enlarged signification generally adopted, some internal organ may have become affected by the disease, either before or after puberty. It is not only external and palpable scrofula which is caused by the scrofulous taint, but also various internal maladies which are actually scrofulous or tuberculous in their nature, and which may be developed into an active state at any period either before or after puberty, an examination, on a single occasion, of numbers thus circumstanced, detecting a few merely from among them with the fully developed or manifested malady.

20. But Mr. PHILLIPS does not stand alone in his scepticism of the generally received doctrine of the obvious hereditary nature of scrofula, and in his faith in statistics, for LOUIS, the apostle of the numerical method in medicine, states, with reference to phthisis, that in reality he had observed nothing decisive in favour of the hereditary character of that disease; and, in another place, that he had not collected any fact in favour of the hereditary nature of phthisis! But there is one circumstance connected with the hereditary nature of scrofula to which the numerical pathologists have paid little or no attention; namely, that the parent or parents may possess the scrofulous taint without any mark of the external or internal disease, and have one or more children which are either affected with open scrofula in childhood, or attacked with phthisis in early life; and even that one or both parents of a scrofulous diathesis, without any developed disease, may have children, whose lymphatic glands or bones become tuberculous in early childhood, or whose lungs are thus diseased after puberty, and yet may not be the subjects of manifest strumous disease throughout life, or not until a far advanced period. In these circumstances the hereditary tendency would not be detected or reckoned by those who employ figures as their arguments, and thus their statistics would be vitiated, or rendered by this and other sources of error altogether worthless. That the hereditary character of scrofula and tubercles has been exaggerated by some writers may be admitted; but that it is so low in amount as some recent writers contend, or even nearly so low, will not be demonstrated by future observers who shall view all the circumstances and facts connected with the subject with due accuracy.

21. Of 80 cases observed by Dr. GLOVER, the predisposition to tuberculous affections — to scrofula in the sense in which I have viewed it — was hereditary in 42; very few of the remainder furnishing clear evidence of the transmission. There appears some reason, he adds (and I agree with him), to conclude "that the popular idea of evidence of the family taint often passing over one generation, or appearing in the uncles and aunts, while the parents are free from the disease under which their offspring labours, may not be incorrect."

22. The hereditary predisposition is, according to my own observation and that of several others, more frequently derived from the mother than from the father, although the difference is not great, much depending upon the causes in operation in early life. The mother of nine children — six females, three males — had early signs of external scrofula; four of the female offspring died of phthisis between the ages of 20 and 30, and one of the males. All the children of the two remaining

females are possessed of the scrofulous taint, and about one third of them have external scrofulous disease. Dr. PRITCHARD has justly remarked, that all original connate bodily peculiarities tend to become hereditary, while changes in the organic structure of the individual, from external causes during life, commonly end with him, and have no obvious influence on his progeny. There is no doubt of the strumous hereditary taint having disappeared from families, especially when it existed only on one side, more particularly when the mother was strong, healthy, and suckled her own children, and when the latter were placed in favourable circumstances in childhood and early life as respected air, locality, ventilation, exercise, and food.

23. *B. Diseases of the parents.* — It has been justly remarked by Sir JAMES CLARK, "that a state of tuberculous cachexia is not the only morbid condition of the parent which entails the tuberculous predisposition on the children; there are several diseases which have this effect, the most important of which are a disordered state of the digestive organs, gout, cutaneous diseases, the injurious influence of mercury on the system, debility from disease, age, &c. In short, a deteriorated state of health in the parent, from any cause, to a degree sufficient to produce a state of cachexia, may give rise to the scrofulous constitution in the offspring." This opinion has been questioned by Mr. PHILLIPS, but I believe it to be in the main correct. Not, however, that parents thus circumstanced necessarily have children who became scrofulous in childhood, or tuberculous subsequently; but that the children of such parents are much more liable to be so diseased than the offspring of strong and healthy parents.

24. (*a.*) *Of the influence of the syphilitic taint, and of the mercurial cachexia in the parent,* in affecting the organization of the offspring so as to favour the development of external or internal scrofula, many writers are quite convinced. ALIBERT says, "that almost all the scrofulous cases at St. Louis are owing to a syphilitic infection transmitted hereditarily;" and CAMPER, STOLL, PORTAL, and HUFELAND, entertain a similar opinion. Others are of a different opinion, especially KORTUM, CULLEN, BAUMES, BAUDELOCQUE, and PHILLIPS. It is impossible to separate the influence of secondary and tertiary syphilis from that produced on the constitution by the excessive or prolonged courses of mercury, as, in former times especially, both were more or less injurious to the constitution of parents, and most frequently in connection with each other. That parents thus circumstanced may have children free from any scrofulous taint may be conceded; but that their offspring are more frequently affected with either external or internal scrofula, at the respective ages of the occurrence of these, than the children of parents who have not been similarly circumstanced, I am convinced by the frequent occurrence of these states of scrofula in children born of a parent or parents, whose constitutions, originally most sound, were deteriorated by one or both of these causes. I am aware that numerous instances will occur of the immunity of the children of parents thus circumstanced from scrofula; but many of these have not been observed or traced further than childhood, or even than the earlier years of this epoch; and of those, thus accounted exempt, or even robust or healthy at this period, many become tuberculous at more advanced ages.

25. (*b.*) *That very aged, gouty, exhausted, or debilitated parents,* have children much more predisposed to external or internal scrofula than the offspring of healthy, mature, or young parents, has been asserted by many, and denied by some. It is more generally admitted, that the children of such parents are delicate; but the opinions of many of the most observant writers of the seventeenth and eighteenth centuries confirm that of FERNELIUS, no mean observer, and justly possessed of the highest reputation in the sixteenth century, viz. "Senes et valetudinarii imbecilles filios vitiosa constitutione gignunt;" and VAN SWIETEN has illustrated the opinion with his wonted ability. In the same category parents who have exhausted themselves by *masturbation* or by *premature or excessive venereal indulgences,* may also be placed. On this subject Mr. PHILLIPS remarks: — "I do not, however, deny that children born of parents advanced in life, as well as those born of youthful parents, may present less of vigour, than the offspring of persons in the prime of health and strength, but it is not proved that they usually become scrofulous:" and he admits only that these children are often, though not always, weakly, and that a weakly child, placed under unfavourable circumstances, is more likely to suffer from scrofula than a strong one, but simply because he is weakly. It is difficult to prove the extent to which children born of parents of the description under consideration are liable to be scrofulous or tuberculous, or are more liable to become so than other weakly children; but that they are actually more or less liable to be thus affected I believe.

26. (*c.*) *Does the milk of a scrofulous nurse occasion scrofula in the child?*—Mr. PHILLIPS has ably discussed this topic, and has adduced opinions in the affirmative as well as negative. BORDEU said that scrofulous nurses communicate the disease to the child. WHITE, FAURE, LALOUETTE, and PUJOL, on the contrary, denied that a nurse could transmit scrofula to her nursling. "But the impression that the disease may be thus communicated, exists on the minds of many medical authorities in the present day." Yet in support of this opinion, Mr. PHILLIPS states, that he knows no single well-observed fact on record. I agree with him in concluding that, although there is no proof of the justness of the opinion, "that the disease may be propagated in this way, neither is it easy to procure proof that it could not happen, since such proof could only be negative; meanwhile, as all our present evidence is negative, we are justified in saying that such communication is, in the present state of our knowledge, inadmissible."

27. (*d.*) *Frequent intermarriages, or marrying in and in.*—It has been alleged by Mr. CARMICHAEL and others, that frequent and close intermarriages are generally followed by a puny race, and frequently by scrofula, in one shape or another. On this topic Mr. PHILLIPS remarks, that there is no clear evidence of the bad consequences, either on the mind or body, of frequent intermarriages. As concerns the human race, the point is not easily elucidated, and the evidence is not con-

clusive that the practice is very injurious in the lower animals. Isolated classes, as Jews, Quakers, &c., furnish no evidence in support of the opinion; but the isolation of these or other classes is not so complete as to determine the question. The closest intermarriages or connections between the sexes exist in several countries of Central Asia, as Thibet, &c.; but the inhabitants are said to be robust and healthy, the population being, however, kept down by one female in a family having several husbands, and those frequently her nearest male relations. Mr. Phillips concludes, that intermarriages among healthy persons tend to no such calamity as the production of scrofula; but that he must not be understood to assert that other physical or mental influences may not result from such unions. I believe, however, that a comprehensive consideration of the subject, and with reference to the lower animals, as well as to man, will show that a close breeding in and in, when continued for more than three or four generations, will occasion a degeneration of the offspring; whilst crossings of races or breeds will give rise to increased development of constitution and power, especially in the weaker race. The Turks and Persians are manifestly indebted to the females of Georgia and Circassia for the best of their constitutional features; and few who have taken any interest in tracing the history of aristocratic families, even in this country, and are acquainted with the private histories, the intrigues, and intermarriages or crossings of many of them since the commencement of the seventeenth century, can fail of knowing how often family descent has thereby been preserved nominally, although not most legitimately.

28. (*e.*) *Does the habitual use of certain articles of food predispose the offspring to scrofula or tubercles?* — It has been supposed that pork and the viscera and blood of animals, favour the occurrence of gout in those who frequently use them as food, and often give rise to scrofula in their offspring. That these articles of diet are very often productive of diarrhœa, dysentery, and other disorders of the digestive organs, more especially in warm climates, cannot be disputed: and I believe that the offspring of those who live much on pork and bacon are more liable to scrofula, in some one or other of its forms, than persons who use a different or more wholesome diet. The food of the parents may reasonably be expected to influence the constitution of the offspring, and hence to predispose to certain diseases, in preference to others. It is difficult to determine the influences, either of an excessive use of animal food by the parent or parents, or of the restriction to vegetable diet solely, in causing scrofula in the offspring; but that either extreme may have a predisposing effect, especially when aided by other causes, may be reasonably inferred. That the vegetable diet of the Hindoos does not exempt them from the presence, if not from the prevalence, of struma, appears to be established. It is not improbable, however, that a vegetable diet in a temperate and healthy climate, when it is wholesome in kind and quite sufficient in quantity, does not, *cæteris paribus*, predispose the offspring to this distemper; whilst the excessive use of animal food, and more especially of the articles of food just noticed as often injurious, is more likely to produce a noxious effect.

29. (*f.*) *Insufficient*, as well as *unwholesome food*, certainly predisposes the offspring to scrofula, both external and internal; and when this is associated, as it too frequently is in the lower classes, with addiction to *spirituous liquors*, the injurious influence is the more marked, particularly when the mother is thus circumstanced and addicted during the periods of utero-gestation and of lactation. I have on numerous occasions remarked this to be amongst the most undoubted causes of strumous affections in the poor; but it is so generally associated with others about to be noticed, especially impure air, and insufficient ventilation, that it is impossible to say truly what degree of influence may be assigned to it solely. The numerical pathologists may, however, assign it a number; I therefore leave its true value to be calculated by them.

30. ii. Causes acting chiefly during early life. — The causes of struma occurring during early life, act directly on the subjects of the distemper. These causes may be in operation during infancy solely, or during later childhood, or not until puberty, or even not until after this epoch. They are amongst the most influential causes of the distemper, especially when acting more or less in combination, as often observed respecting some of them. It is generally difficult to determine the influence of each, or even of several of them, when operating either co-etaneously or in succession, particularly when the constitution presents an hereditary taint, and, in this case, those causes are the most efficient in developing this taint into open or manifest disease.— The *milk* of the nurse, especially if she be circumstanced or addicted as just mentioned (§ 29.), or if her health be such, owing either to natural delicacy of constitution or to disease, as to render her milk insufficient, innutritious, or unhealthy, is a most influential cause of debility and disease of the infant, this disease assuming more frequently the form of internal or external scrofula, than any other. In connection with suckling of the infant, there are several causes which often concur in the production of the morbid effect; the most influential of these are the articles of food given to the infant either supplemental of the milk of the nurse, or during and after weaning, and the state of the air which the child breathes by night as well as by day.

31. *A.* The *food* and *drink* which are best adapted to the infant, before it has got several teeth, is the milk of a healthy mother or nurse; and in as far as a departure from this food takes place, so far will the development of scrofula be risked. When the mother is incapable of suckling, or her milk is unhealthy or insufficient, a healthy nurse is required; and if she cannot be obtained, then the best means of feeding the infant should be adopted. In the various circumstances in which children are brought up, it is very difficult to determine the share of injury, which may be imputed solely either to the nature and amount of their food, or to the state of the air which they breathe, or to the other influences which surround them. M. Benoiston de Châtanneuf states, that of infants nursed by their mothers in Paris, 18 per cent. die in the first year, and that of those suckled by strangers, 29 per cent. die in the same time, Doubtless much of this mortality is to be imputed to other causes, as to the close unhealthy air of a

large city, as well as to those connected with the food of infancy. Both in towns and country districts, healthy wet-nurses cannot be obtained owing to the circumstances of the majority of those requiring them; and artificial feeding becomes their only resource. This feeding, independently of the many unfavourable influences which concur with it, fails of furnishing an appropriate nourishment; and consequently a very large proportion of the infants who are subjected to this mode of rearing, die in their first year; and of those who live, many become the subjects of internal or external scrofula. Mr. PHILLIPS has adduced a series of statistical details, illustrating the deaths during infancy of the inmates of several infant institutions, where the children are brought up by hand; and in these the deaths in the first year appear to vary from upwards of 80 to 50 per cent. In *Lyons*, a crowded manufacturing town, where the infants are suckled, the mortality in the first year was 33 per cent.; the ordinary mortality at Lyons during the first year being about 20 per cent. In the London Foundling Hospital, where the children are provided with wet-nurses, the deaths are 22 per cent. during the first five years, and of these 10 per cent. only die during the first year; but it should be recollected that a child is rarely admitted before the third month, and that it is during the first three months of life that the mortality is greatest. In large manufacturing towns and cities the number of infants reared by hand is greatest, and the deaths are also much the greatest; and the proportion of the survivors that become scrofulous is also the greatest. In London, the number of infants thus reared who die during the first year is three or four times as many as those who die from among those similarly reared in the country.

32. Whilst very much of the mortality, and of the disease of the survivors, of those reared by hand, is to be imputed to this cause, much also should be referred to the kind of food which is substituted for the milk of the mother, to the air which the infant breathes, and to the other circumstances by which it is surrounded. As respects the *kind of food* which is thus substituted, it may be stated that, in manufacturing towns, where the married women employed in the factories rear their infants by hand, little attention is paid to the nature of the food, and few of the children survive the first or second year, most of the survivors becoming scrofulous or tuberculous. Mr. PHILLIPS justly remarks, that there are two things to be noted in respect of children thus circumstanced, viz. the nature of the food and the manner of taking it. The food, even if it be milk, instead of being drawn directly from the mother, has probably been obtained some time before from a purely herbivorous animal—the cow, between the milk of which and that of human milk there is a very considerable difference, that of the former containing more than twice as much caseine, and much less butter and sugar of milk. Moreover, in towns the milk of cows is often unwholesome, especially to infants, owing to the confinement of, and modes of feeding, these animals, and not unfrequently to tubercular disease developed in them by these causes. The same author justly adds, that the mode of taking the food exercises an important influence on the health of the infant. By the act of sucking, a certain quantity of saliva is pressed into the mouth, and is mixed with the milk so as to render its digestion easier. Indeed, this is essential to good digestion in infants. Moreover, the act of sucking is an exertion which can be made only for a certain time, and hence over-distension of the stomach is prevented; whilst, when fed by hand, the risk of over-feeding is often run, by the anxiety of the nurse, and harm from this is not infrequent.

33. In the greatest number of instances, instead of milk, gruel with a little milk, sopped bread, or flour, or other farinaceous substances are used. This food is assimilated with difficulty, and readily gives rise to acidity, flatulence, and irritation of the digestive mucous surface, with all the consequent evils of insufficient secretion and excretion and impaired nutrition. Mr. PHILLIPS justly remarks, that these evils are made evident by the following facts:—"In Lancashire and the West Riding of York, the deaths in the first year of life are to the total deaths as 1 to 3·9; while in Devon and Wilts, they are 1 to 6·4! Now it is in the great factory towns, which are found in Lancashire, Cheshire, and Yorkshire, that the system of bringing up the child by hand is most commonly practised, and where its evils are most apparent; first in the great destruction of infant life, and failing that, in the development of scrofula. It is not that the mother has no milk, but that in such places she is enabled to make what she considers a more profitable use of her time, than by staying at home and nursing her child. Her infant may be suckled at early morn, and again in the evening, possibly too, at the middle of the day; but whatever food it may require at the intervening periods, if furnished at all, is afforded in the shape of the crudest and most inappropriate substances, and restlessness is known, in many places, to be habitually repressed by Godfrey's Cordial." But the mothers are not solely the guilty parties in these circumstances. The fathers are often so drunken and dissolute as to provide little or no food for their families, and the mothers are therefore obliged to be employed in the factories to provide for the wants of their children, entertaining at the same time but little desire to add to their number, or to devote much care on those which require it the most.

34. The digestion of infants is rapid, and as the quantity of food taken at a time is small, it is necessary that, during the first month, the interval of feeding should not exceed from one and a half to three hours. If, in addition to inappropriate food, the intervals between the periods of administering it be much more prolonged, as it often is in manufacturing towns, the evils must be so much the greater. Mr. PHILLIPS states, that in the larger factory towns, the deaths from tuberculous and scrofulous diseases are as 1 to 31 of the total deaths during the first year of life, whilst in the metropolis they are as 1 to 42. During the whole of life, they are 1 to 5·6 in the factory districts, and 1 to 6·4 in the metropolis. According to the experience of Friendly Societies, he adds, the expectation of life in rural districts, at 30 is 38·4 years, and in cities 32·8 years. Of the total population living at the age of ten, one half will have disappeared in cities before the age of 62, and in towns before 65; whilst in rural districts half the population will attain nearly 69 years. The greater longevity of the latter, or the

less prevalence of scrofula, is not to be imputed to the food only, even granting this be more nutritious and more appropriate, for the former may possess the greater advantages in this respect; but to the air, ventilation, exercise, &c., enjoyed by those residing in country districts.

35. Dr. Baron Howard gives a just but melancholy description of the character of many of the operatives in large towns.—"A large proportion of those who regularly receive high wages are constantly in a state of the greatest poverty, and often bordering on actual starvation; their houses are almost destitute of furniture, comfortless, and uncleanly; too often damp, cold, and ill-ventilated. Their families are ill-fed, scantily clothed, and badly lodged. They live much on innutritious and indigestible food, and often use articles of bad quality, or such as are rendered unwholesome by adulteration, or by being kept too long. They are extremely intemperate in their habits, and instead of purchasing wholesome food and proper clothing, the greater part of their wages is often expended by anticipation at the public house. The effect of the intoxicating liquids they consume is of course to produce a temporary excitement of the whole system, which is succeeded by a corresponding depression; they lose all relish for plain nutritious food, and their appetites can be stimulated only by something savoury and piquant. This kind of diet does not afford sufficient nourishment to repair the losses the body is continually sustaining; great languor and debility are the consequences; for the removal of which stimulants are again had recourse to, and thus an alternately excited and depressed state of the system is kept up. By this mode of life too, the digestive organs become impaired, and the function of digestion is so feebly and imperfectly performed, that even much less nutrition is extracted from the indigestible and impoverished diet they use, than would be the case if the digestive organs were in a healthy condition." This writer adds, that "scrofula in all its varied forms may be mentioned as one of the commonest diseases prevalent among the destitute poor, and which frequently originate in deficiency of food." There can be no doubt of the justness of the conclusion at which Mr. Phillips arrives from his researches, namely, "that in Great Britain scrofula is least prevalent where children and others are best fed; and although I by no means assume that the immunity is entirely owing to better feeding, because where much attention is bestowed on the food, it is hardly likely that other means of maintaining health will be neglected; yet I would submit as a fair deduction from the foregoing evidence, that food exercises a more important influence than any other agent in the production of scrofula."—(*Op. cit.* p. 175.)

36. (*a.*) *What influence has particular kinds of food in causing scrofula and tubercles?*—This question has been differently, but not satisfactorily answered. Several articles of diet have been accused of producing this effect; and to certain of these I have adverted above (§ 28.). Haller was amongst the first to mention the opinion of the prevalence of this distemper being caused by the use of potatoes. The use of these, as the staple article of food in Ireland, where scrofula is more prevalent, and the value of life is less than in England, tends to show that they may be concerned in producing these effects; but it ought not to be overlooked that they afford insufficient nourishment, and that there are other causes in operation. Mr. Phillips believes that those who live almost exclusively on vegetable food in this country are less robust, and exhibit a greater tendency to scrofula, than those who subsist on an admixture of animal and vegetable food; and he considers, that our own rural population, as well as that of Scotland and Ireland, bear out the assertion. "But, although it has been shown that insufficient and improper food, however associated, may lay a foundation for that disease, we have, in truth, no conclusive proof that any particular article of food directly tends to the production of scrofula."

37. (*b.*) The *drink* or *beverage* used by infants and children has no mean influence in favouring the development of scrofula, and of tubercles at a more advanced age. Among the lower classes, especially in large and manufacturing towns, the frequent recourse to anodynes and carminatives, containing narcotics, sedatives, &c., in order to procure sleep or quiet for infants and young children, and to allay their wants, cravings of appetite, and irritations of temper, is of itself no mean cause of their weakness of constitution, of imperfect development of both mind and body, of scrofulous and tubercular formations, and of various other diseases, as they advance to puberty and manhood. The not infrequent practice, amongst the lowest and most abandoned classes, of giving spirituous and other intoxicating liquors to their children—of causing their infant offspring to partake of the noxious beverages in which they are themselves indulging, is productive of effects, in the innocent victims, of a similar kind to those just stated. The vices of the parent are, in the present state of society, not merely passively propagated in the offspring—to even the third and fourth generation; but are not infrequently most actively and feloniously extended, at the most tender and helpless periods of existence, to those for whom the ties of nature should be most intimate and indissoluble.

38. *B. Contaminated states of the atmosphere* are often not less influential than the nature and quantity of the food in causing scrofula and tubercles, and frequently they are the chief causes. The air may be contaminated by exhalations from drains, cesspools, sewers, and water-closets; or by stagnation or insufficient renewal; or by being respired frequently or by a number of persons or animals, without the requisite renewal; or by these several causes conjoined. In a very large proportion of the houses in manufacturing and other towns, as well as in many in country districts, the water-closets, drains, and sewers, are so imperfectly constructed as to admit of the evolution of the foul air from the exuviæ, &c. of the inhabitants, not only around, but even within their dwellings, so that they who reside in those houses are constantly breathing an air loaded with the vapours arising from the decomposition of their own excretions, which remain collected under, or close to, or even within, their apartments. These sources of contamination have been fully exposed in the article Pestilences—Protection from (§ 9. *et seq.*).

39. *C.* Next in importance to this source, is the *congregation of numbers in a close or insufficiently*

ventilated place, more especially in a close sleeping apartment. Amongst the most prevalent causes of scrofula and tubercles, especially in the present state of society and manners, there are perhaps none more influential than congregating children and young persons in boarding and large schools, where they are often scantily fed, and through the greater part of the day restricted in air and exercise,—confined in a school-room, often insufficiently or improperly warmed, and imperfectly ventilated, in order to economise fuel,—subjected to premature mental exertion, or to cramming modes of instruction,—and packed into sleeping apartments insufficiently ventilated and much too small for the number confined in them. It is a common practice in boarding schools in large towns to put from six to twenty children or young persons in the same sleeping apartment; and the parents are, from ignorance, or the delusion of having a bed assigned to each, contented with the arrangement. Many such apartments even have not, during night, any ventilation, excepting what takes place by the fire-place, both the doors and windows being closed; and so foul does the air become by the morning, that it is sickening to a healthy person entering the chamber, so completely is it loaded with the emanations resulting from the insensible and sensible perspiration, and from having been repeatedly respired.

40. This *self-contamination* of the air is often only supplemental of the contaminations derived from other sources, especially from such as have been just mentioned; and which, although injurious in many private seminaries, are even still more so in many large institutions and charities, owing to the congregation of greater numbers, particularly in sleeping apartments, to ill-regulated diet-tables, to insufficient exercise in the open air, at a period of life which requires air and exercise for the healthy development of the frame, and to the over-exertion of the mind to the neglect of healthy pastimes and amusements. This cause is especially productive of the more internal forms of scrofula, and particularly of tubercles of the lungs; and is the more influential as being in continued operation during the periods of the growth and development of the frame. These congregations of young persons, especially during the age of puberty,—at the period of sexual evolution, when instinctive impulses are too strong for the controul of the weakly-exerted dictates of reason, often lead to practices which tend — and tend more than any other cause, especially at such early periods of life — to exhaust the powers of life, to impair and vitiate nutrition, and to favour the production of the several forms of the distemper now being considered. This mode of life, at this early age, as well as several others to which the lowest and even the highest, are often subjected — the one from misery and necessity, the other from ignorance, vanity, and excessive care, — is not infrequently rendered still more injurious by the want of due exposure to the sun and air.

41. *Exhalations from privies, cess-pools, drains, and sewers*, especially in large institutions, manufactories, and towns, occasion this as well as other states of constitutional disease; and to these are often added the emanations from burying-places. Amongst the poor, the influence of cold, often conjoined with humidity, and with over-crowding and insufficient ventilation; the exhalations from the soil, and from the animal and vegetable matters which are undergoing decomposition in or upon the soil; living in damp cold cellars and apartments on the ground floor, insufficiently drained and ventilated; and want of light and sunshine, are causes which aid the operation of hereditary predisposition, and of deficient or improper food.

42. Children and young persons subjected to the causes now mentioned become delicate or sickly. The vital endowment and the structural development of the several organs and textures are impaired or arrested in their progress. Like plants growing excluded from sun and wind, their vessels often extend rapidly in the direction of their axis; but the parietes of the vessels and their lateral branches are thinly or weakly formed, are surrounded by a lax cellular tissue or parenchyma, and both the organic nerves and the animal fibres are imperfectly constituted. The formative processes seem arrested before they are completed. The circulating fluids present a superabundance of the serous and albuminous constituents, and a deficiency of fibrine and of red-globules. Whilst the blood is defective in its crasis, the blood-vessels are impaired in their tone; and the veinous and lymphatic systems are more manifestly or more prominently developed. This condition of the frame often proceeds, as shown above, from the parent or parents. In many cases it is acquired in early life from various causes, especially from those now mentioned, as insufficient or improper food, breathing an impure or self-contaminated air, a cold and humid atmosphere, or dark, cold and damp apartments, cellars, &c., the crowding of numbers in ill-ventilated places, and particularly in sleeping apartments, premature sexual indulgences, and solitary vices which waste or exhaust nervous and vital power, and consequently impair the digestive and nutritive processes, at the periods of life when due assimilation and nutrition are most required; and, whilst these causes often generate this state of frame, they produce, in various parts, textures, and organs, but particularly in the lungs, the deposit of tubercular matter.

43. There are other causes or circumstances influencing the constitution of young persons which have been viewed by some, and denied by others, to be concerned in the production of scrofula. But much of the difference of opinion on these topics depends upon the limitation of the term scrofula, or the extension of it, to the senses already stated (§ 4. *et seq.*). That confinement in prisons, in poor-houses, in asylums, in charitable institutions for education or reformation, in factories, &c., will occasion some form or other of scrofula, more especially tubercular deposits in internal organs, cannot be gainsayed with truth, although this morbid effect may be manifested in so few as to almost justify the denial of its existence, especially where a sufficiency of wholesome food, exercise in the open air, due light, ventilation, and sunshine are enjoyed. But where these are more or less wanting, and especially where there are over-crowding, particularly in sleeping chambers; low ranges of temperature, conjoined with dampness; contaminated states of the air; depression of spirits or anxiety of mind, &c., the morbid effects will soon become manifest, and

frequently in the forms constituting those now under consideration. Most of the causes already considered have been numerically and statistically investigated by Mr. PHILLIPS, who has thrown much light upon several of them; but, in the extended sense in which I have viewed the subject, — not solely with reference to external scrofula, nor to childhood, but with regard to both the external and internal distemper, as observed at all periods of life,—I believe that several causes, which he views as possessed of little or no influence, are actually deserving of more consideration and elucidation than they have hitherto received. There can be no doubt that, in the several circumstances just enumerated, and in the different classes, positions, and employments of life, certain causes are more influential in some of these than in others — in one class or occupation than in the rest; and that, where several causes are in simultaneous action, it is difficult to estimate the relative value of each; but, nevertheless, whatever cause has the effect of lowering the powers of life, of impairing assimilation, nutrition, and strength, will, in a considerable proportion of those thus affected, give rise to tuberculous deposits, particularly if an hereditary predisposition or constitution already exists, and will reinforce or determine the action of other agents in developing this mischief.

44. *D. May scrofula and tubercles be communicated by contact or inoculation?* — (*a.*) ARETÆUS believed in the communicability of scrofula, and considered it dangerous to live in the same room with scrofulous persons. BAUMES, CHAUMETON, and others, have entertained the belief of the transmission of the disease to infants suckled by scrofulous nurses. BORDEU, no mean authority, states that young healthy women have married scrofulous men, and have become so themselves. BAUDELOCQUE, however, remarks that, in the "Hôpital des Enfans" there are 150 beds occupied by scrofulous patients, but that he has never observed any thing that occasioned a suspicion of contagion. Mr. PHILLIPS says that he never heard of a single instance of the communication of the disease by contagion in the several institutions which he has visited. PINEL and RICHERAND have furnished a similar testimony.

45. (*b.*) *Inoculation* of scrofulous matter was practised by HÉBREARD on dogs, but no sign of scrofulous infection was observed. LEPELLETIER tried similar experiments without effect; and Mr. PHILLIPS states that LEPELLETIER, GOODLAD, and KORTUM applied scrofulous pus to the wounds made for vaccination, and also to wounds made without reference to vaccination, but that scrofula was not produced, although the vaccination succeeded when the vaccine lymph was introduced with the scrofulous pus. Such experiments are most unwarrantable, and even criminal.

46. There may be but little risk of infection from cases of scrofula, when the disease is seated externally. But I believe that there is some reason for believing tubercular disease of the lungs, in the second and third stages, by no means devoid of risk to healthy persons, who may frequently inhale the breath of persons in either of these stages of the malady, or may sleep in the same bed, or even live in the same room, if small or ill-ventilated, with persons thus diseased. It should not be permitted for a sickly or scrofulous child, or even for any one with pulmonary tubercles or with open scrofulous sores, to sleep in the same bed with a healthy child or person, however confidently several writers may assert the non-communicability of this distemper; for, although this may be true in ordinary circumstances, those which I have just mentioned may favour the occurrence of very different effects.

47. (*c.*) *May pus from a scrofulous person, although not derived from a scrofulous ulcer, communicate the malady?*—It has been supposed that leucorrhœa in scrofulous females, and that vaccination, or variolous inoculation, from a scrofulous child, will communicate scrofula to persons of a sound constitution. Several writers have favoured the affirmative of this question, but their facts are false, and their reasoning inconclusive. Mr. PHILLIPS remarks that "an important question is raised by RILLIET and BARTHEZ with reference to the influence of small-pox and scrofula. We have seen that DE HAEN and ROWLEY were of opinion that the inoculation of small-pox had a tendency to excite in the system the development of scrofula; while RILLIET and BARTHEZ state, that in any of the variolous cases they have observed, the eruptive fever has not been terminated by tuberculisation. They believe it to be proved that small-pox and tubercular disease are of different natures and mutually repel each other; that since the use of vaccination tubercular diseases had become more frequent; that those children who die without having had small-pox are more frequently tubercular than otherwise; and that of those vaccinated a greater number are disposed to tubercles than of those who have not been vaccinated. They, however, guard themselves from assigning vaccination as a cause of tubercles; all they have been able to observe is, that a greater number of vaccinated children die with than without tubercles. The only precise evidence they furnish for the opinion is the following: — Of 208 vaccinated children, 138 died tubercular, 70 non-tubercular. Of 95 children who died without having been vaccinated, 30 were tubercular, 65 not so." — (p. 149.)

48. These results certainly agree with my own observations, and confirm an opinion I have long entertained respecting the comparative effects of vaccination and small-pox upon the prevalence of scrofula. That scrofulous and tubercular matter may become partially resolved and absorbed, the cretaceous or mineral parts of the deposit only remaining, has been proved to take place, but the exact circumstances in which it does take place have been very insufficiently ascertained. RILLIET and BARTHEZ believe that small-pox more especially, scarlatina and typhoid fever, tend to favour this resolution. That scrofulous and tubercular affections have increased since the introduction of vaccination is undoubted; and that the dangers from the inoculation of small-pox, under due management and care in preventing the occurrence of the non-inoculated disease, were actually few, although remarkably exaggerated, are also certain; so that balancing the results from the introduction of the one, and from the suppression of the other, it is very difficult to say, that humanity or society has gained any thing by these measures.

49. *E. May other diseases occasion scrofula and tubercles?* — As already shown, it cannot be doubted that vaccination favours the prevalence of the several forms of scrofula; but it is not evident

how this result is produced. Can it be occasioned by the inoculation of a virus, which, although productive of a local effect, causes a certain taint of the constitution, which is not prevented, or removed, by its elimination in the form of pustules on the external surface? According to this view, vaccination may be, in many instances, the introduction of a poison or virus, which slowly and silently contaminates the frame, without being maturated and thrown out on the surface; whilst small-pox has a very different effect, owing to the free suppuration of the pustules and the elimination thereby of the morbid material or virus from the system. Besides vaccination, inflammations, measles, hooping-cough, &c. have been supposed to favour the production of scrofula; but there is not sufficient evidence to prove this occurrence, further than that all diseases which lower vital power and resistance will more or less aid the operation of the more efficient causes of this distemper. Notwithstanding the laudation bestowed upon vaccination, I believe that, as the lapse of time allows the fact to be more fully demonstrated, it will be found to be a not unfruitful source of scrofula and tubercles; and that its effects will be imputed to the circumstance just mentioned.

50. *F. Climate, residence in large towns, occupations in factories, confinement in union-houses, in pauper institutions, in prisons, &c.*, and other circumstances tending to prevent due exercise in the open air, or sufficient ventilation, or to deprive persons in early life of the requisites to healthy assimilation and nutrition, may be considered as concurring agencies in the production of either external or internal scrofula. Mr. PHILLIPS has investigated these analytically, but with reference only to the production of external scrofula, and has come to the conclusion that "the development of scrofula is not shown to be so influenced by climate or temperature as to bear any definite relation to the warmth or coldness of the country in which the disease is found. Neither the general mortality, nor the deaths from scrofulous diseases, bear any definite relation to the closeness with which the population is crowded together, whether the comparison is made between one town or district and another, or between different portions of the same town or district. Particular occupations and social conditions exercise a greater influence on health and the duration of life, than is produced by impure air or insufficient ventilation, but they do not operate in the production of scrofula in the sense of a specific agent, or of a direct cause. The general mortality and the deaths from particular diseases, bear a close relation to the poverty of the population, and to the vicissitudes, or alterations of prosperity or adversity, to which they may be exposed; whilst wealth and station, which insure to the more elevated classes of the community abundant food, ample clothing, convenient and well ventilated dwellings, and pure air, are nevertheless unfavourable to longevity; and the industrious labourer, whose toil insures steady remuneration, and whose temperate habits and provident character insure him the necessaries of life, good of their kind and ample in quantity, is in the condition the most favourable to long life and uninterrupted health. In the last result, then, it is to diseased nutrition, however brought about, that we refer the production of scrofula; an opinion in which there may be some novelty, inasmuch as many authors have assigned to perverted nutrition a powerful agency in developing the disease — especially CARMICHAEL in England, and LEPELLETIER and BAUDELOCQUE in France; yet my controversy with BAUDELOCQUE consists in a denial of the exclusive agency which he assigns to impure air in deranging nutrition." (p. 239.)

51. Whilst the disease is imputed chiefly by Mr. PHILLIPS to insufficient food, the other circumstances, which I have viewed as concurring causes of no mean influence, especially a self-polluted or otherwise contaminated air (§§ 38–42.) are considered of little importance by him, provided that the food is sufficient. It is manifest, however, that his investigation of external scrofula, chiefly with reference to an early age, has led him to overlook the more remote influences of certain causes, which he accounts of little importance. "But the cause of diseased nutrition," he remarks, "at that period of life when the seeds of scrofula are sown, is, in the vast majority of cases, insufficient food or improper feeding; and even if the less direct agencies, which we have been considering, occasioned scrofula much more frequently than we believe they do, the distinction is of great practical importance,— viz. that they do not act in virtue of a specific influence suited of itself to produce scrofula, but as general morbific agencies which impair digestion, and thus indirectly contribute to the production of the disease. That food, insufficient in quantity, or innutritious in quality, stands in the relation of cause to the development of scrofula, more directly than any other morbific agent, is shown by this circumstance, that whenever food is abundant in quantity, and of a sufficiently generous character, scrofula is kept under, that is to say, it is less frequently seen, although other noxious agents are, perhaps, rife, and the general mortality is great; and that in our rural districts, where the air is probably pure and the occupation healthy, and where the general mortality is small, scrofula is largely developed; because the food, even when abundant, does not contain sufficient stimulus to preserve the frame in healthy vigour. Yet, although we may have no satisfactory proof that a contaminated atmosphere, or any one of the other indirect agencies to which we have referred, will operate so injuriously on the digestive functions as of itself to induce scrofula, I do not the less deplore the influence of those debilitating agencies, which impair the healthy activity, and lessen the proper vigour, of large numbers of our countrymen." (p. 241.) But that the injurious or indirect agencies which Mr. PHILLIPS considers so little influential, are really of importance as respects the development of external and internal scrofula, both in early life and in more advanced age, I am convinced, although a sufficiency of wholesome food will counteract them to a considerable extent, and especially when an hereditary taint or predisposition is not present.

52. The injurious influence of insufficient feeding in poor-houses, union-houses, in other pauper institutions, and in prisons, has been sufficiently demonstrated by CARMICHAEL, BALY, PHILLIPS, TYLER SMITH, and others. But it is not to the insufficiency of food alone that the production of scrofula should be imputed, although it may be admitted to be the chief agent. Crowding of the sleeping apartments, breathing an impure or con-

taminated atmosphere, insufficient ventilation, confinement or deprivation of exercise in the open air, and depression of spirits, co-operate more or less with this more efficient cause. But, as in most of the union-houses, the inmates have more food than the independent labourer can procure, even when fully employed, it cannot be a matter of surprise to find scrofula more prevalent in some country districts than it is even in some manufacturing towns. In connection with this subject Mr. Phillips very justly remarks, that, believing the health of the child, and the vigour of the man, to depend upon the sufficiency and nutritious character of their food, a still more liberal diet for pauper children than is at present afforded would, at one and the same time, better the health of our population, and be consistent with a sound national œconomy. The reports of the Inspectors of Prisons furnish numerous instances where prisoners have manifested glandular tumours under the discipline to which they have been subjected, and have quickly rallied under an improved diet. Dr. Baly states, that a " marked difference in respect of their general health and the number affected with scrofulous disease is presented by the convicts sent to the central prison at Milbank, from different parts of Great Britain, preparatory to their transportation. By far the thinnest convicts, and the largest proportion of unhealthy and scrofulous individuals come from the Scotch prisons, in which the diet consists of a sparing allowance of vegetable and farinaceous food."

53. iii. Other Causes concurring in the Production of the Scrofulous Taint, and aiding or determining the Development of Tubercular Formations.—*The Causes* which have been here insisted upon are certainly the most influential in the production of latent and developed scrofula and tubercles; *but there are others*, which concur with the foregoing either in producing a scrofulous taint, or external scrofula merely, or in developing internal tubercles, especially in the lungs, in persons who are already imbued with this taint, and which, when acting energetically, may produce this effect even on those who are not manifestly thus imbued. In this latter case, the causes in question, acting either independently of the foregoing causes, or conjointly with them, or aiding and determining their effects, impair not only the vital energy and vital functions throughout the frame, but also the nutrition of the several tissues, and the intimate condition of vital cohesion and action. Many young persons, possessed of a scrofulous diathesis, or who have been the subjects of external strumous disease in childhood, and even some who present no very marked sign of a scrofulous taint, become, as puberty, or early manhood, or more mature age, is arrived at, the victims of tubercular formations in some internal organ, especially in the lungs, owing to the operation of those causes, which I am now about briefly to consider.

54. *A. Neglect of Exercise in the open Air* — of exposure to the light of day and to sunshine — is one of the causes which is most influential in superinducing tubercular formations in the scrofulous diathesis, and even in constitutions which evince no evidence of this taint. The general neglect of the indications suggested by the alternations of night and day — the neglect of repose during the hours of darkness, and of rising and of being employed during the hours of day — the common practice of pursuing our avocations and recreations during a large portion of the time intended by nature for our repose, and of devoting a large portion of the day to sleep, is not without influence in impairing the constitutional powers, in weakening the assimilating and excreting functions, and in relaxing the mental vigour. An early departure to nocturnal repose, and the limitation of this repose to the hours of darkness — the trite maxim of " early to bed and early to rise," &c., is of much greater importance than is indicated by the practice of modern times.

55. *B.* Inattention to a *due preservation of the cutaneous function* is not without its influence. The imperfect performance of this function, the sudden arrest of it, or the entire suppression of it, however well it may be vicariously discharged by the lungs, kidneys, or intestinal canal, endangers the healthy condition of the blood, and disorders the assimilating processes. It should not be overlooked, in our pathological speculations, that the cutaneous function is supplemental of other important functions — of the respiratory, of the renal, of the hepatic and of the intestinal, — and that, even when no supplemental or vicarious office may be traced to this function or to either of these other functions, a very intimate relation subsists between them, the due discharge of the one influencing the others more or less. The importance, therefore, of duly regulating this function, guarding against its excess as well as its suppression, by proper clothing and exercise, will be admitted.

56. Among the *dark-skinned races*, a free and even an abundant cutaneous perspiration is most necessary to the continuance of health; and when it is habitually diminished, especially by migrating to a colder climate, tubercles, especially in the lungs, supervene in very numerous instances. A diminution of the accustomed perspiration may not, however, be the sole cause of this liability of the Negro and other dark races to tubercles after migrating to temperate or cold climates. The sedative influence of cold upon the constitution of these races may have a considerable or chief share in the production of this effect, especially in connexion with the obvious want of adaptation of the constitution of these races to temperate and cold climates. Of the *influence of Climate* generally upon the prevalence of scrofulous and tubercular diseases no precise data exist. The subject, however, will be adverted to in the sequel, and in the article on Tubercular Consumption.

57. *C.* Intimately connected with the foregoing is *the influence of Dress and of various Physical Conditions depending on Occupations and Habits of Life.* Exposure of parts of the frame requiring protection or uniformity of temperature, as the upper regions of the chest, and the hips and lower extremities, to vicissitudes of season and weather, and sleeping in too low a range of temperature, are injurious, the effects being more frequently manifested in the lungs than in any other organ. To restrain habitually the movements of the thoracic and abdominal parietes, by position, by occupation, or by dress, or to otherwise embarrass the function of respiration, is much more injurious than is generally considered. The stooping position, particularly when long continued, or frequent; stooping at a low desk or table, especially if a part of the parietes of the chest is brought in contact with, or rests upon,

the desk; and, above all, stiff and closely-laced stays or corsets, are amongst the most injurious agents to which youth or mature age can be subjected, and their effects are most frequently manifested by favouring the development of tubercles.

58. Stiff or unyielding stays prevent the due exercise of the muscles of the trunk, impair their development in early life, and weaken these muscles at later periods. If this article of dress be too closely applied or drawn around the waist, the movements of the ribs are restrained or even prevented; the liver is carried upwards, and it invades the thoracic cavity, compressing the lungs and embarrassing the circulation through the heart and large vessels; and the colon is more or less displaced, or pressed upon, with the rest of the abdominal viscera. The undoubted consequences of these conditions — consequences, which vary in amount and danger with the cause now assigned — are an imperfect performance of the respiratory, of the digestive, of the assimilating, and of the excreting functions; and ultimately a morbid state of the blood, tubercular depositions, especially in the lungs, hæmoptysis, anæmia, &c.

59. Not less injurious than tight lacing is the practice of wearing unyielding supports in the stays, especially steel supports, which, however well covered, tend to carry the electro-motive influence from the frame, and to withdraw a salutary stimulus of nervous power from the system. The importance of attention to this matter is not hypothetical but real, as proved by long and frequent observation, and by the results following the removal of this evil. The more freely the movements of the trunk and spine are allowed to be performed, and the more efficiently the actions of the muscles concerned in these movements are accomplished, the more certainly and healthily will the functions of the several organs contained in the trunk be discharged. (See art. DISEASE, § 23. *et seq.*)

60. *D. Excessive secretion*, and more especially an excess of the recrementitious secretions, or an undue discharge of the latter contrary to the intentions and indications of nature, and particularly the unnatural and debasing vice of manustupration — a vice most generally practised by prudes, the unmarried, and the sanctimonious — have no mean influence in the production of tuberculosis, especially of the lungs, even independently of the pre-existence of a scrofulous diathesis. The vice now adverted to, and a premature or excessive sexual intercourse, are injurious both by the discharge from the œconomy of a secretion intended to aid the healthy development of the frame, and afterwards to support and to promote the nervous and other functions, and by the frequent and excessive excitement, by which this discharge is preceded, a consequent state of languor, depression, and vital exhaustion always resulting.

61. *E. Prolonged mental application*, or exertion, is more or less exhausting to both mind and body, as respects not only its direct operation, but also its indirect influence, especially in preventing a salutary recourse to hygeienic measures, and inducing a neglect of exercise in the open air, of change of air, and of the various recreations which tend no less to strengthen the body than to invigorate the mind.

62. *F. An inordinate indulgence of the passions* and affections; the various depressing moral emotions, anxiety of mind, hope deferred; frettings and disappointments, losses of fortune and friends, and all the sentiments which tend to weaken the organic nervous energy and lower the heart's action, more or less affect the digestive and assimilating as well as the excreting functions, lower the powers of life, vitiate the circulating fluids, impair or alter the nutrition of the structures, and thereby favour or develope tubercular formations. But it is unnecessary to pursue this topic any farther, as it is more fully considered in another part of this work (see art. DISEASE, *the Causation of*, § 22. *et seq.*).

63. III. OF THE PATHOLOGY OF SCROFULA AND TUBERCULOSIS. — Writers on scrofula and tubercular deposits have differed remarkably not only in respect of the identity of these morbid states, but also as regards the origin, modifications, complications, and various other pathological relations of both. It will, therefore, be requisite to describe — 1st, *The Structure of Scrofulous and Tubercular Matter* — *a.* as anatomically displayed, — *b.* as appearing under the microscope, — and *c.* as determined by chemical examination; 2nd. To enquire into *The Identity and Dissimilarity of Scrofula and Tubercles*; — 3d. To consider *The Pathological Relations, Origin, and Nature of these Maladies*; — 4th. *Their Localization or Seats*; — 5th. *Their Modifications and Complications*; — 6th. *The Comparative Pathology of Scrofula and Tuberculosis.* — The discussion of these topics will prove the best introduction and guide to the consideration of the very important subjects of the *prevention* and *cure* of these very prevailing diseases.

64. i. THE STRUCTURE OF SCROFULOUS AND TUBERCULAR MATTER. — Scrofulous and tubercular matters are peculiar morbid formations, the product of an altered secretion and nutrition of the parts containing them, arising independently of inflammation, although frequently associated with a modified state of inflammatory action, apparently induced by these morbid products. These morbid formations are different, — 1st, from the products of ordinary inflammation, occurring in a previously healthy constitution; — 2nd. from other morbid growths, as shown in the article on Scirrhous and other Morbid Tumours. The scrofulous change, matter, or deposit, present various appearances, superficially, according to its stage, its seat, and the alteration of the surrounding tissues; yet it is essentially the same, at each of its stages, whether it is formed in a scrofulous external gland, or in an internal organ. It varies chiefly in grade or stage, or in the successive changes which it undergoes, and in the form of its infiltration, especially at an early stage. Opinions, however, on these and other allied topics are extremely various, but I shall notice the chief of them.

65. *A. The Physical or Anatomical Structure of Scrofulous and Tubercular Matter.* — (*a.*) As respects *scrofulous* or *enlarged superficial lymphatic glands*, the difficulty has been to demonstrate the changes which take place at the commencement, or at an early period of this disease. The question to be solved respecting them is whether the tubercular deposit, which is undoubtedly the chief change even in them, is the primary mani-

fest lesion, or whether the increased vascularity often attending this deposit, is the primary morbid alteration? This question will, however, be more fully considered in the sequel, but before it can be entertained, the appearances presented by the scrofulous deposit, in various situations and seats, require to be noticed. The most obvious change in a scrofulous gland is its increased size. **Lloyd** and **Soemmering** ascribe this enlargement chiefly to thickening and increased vascularity; but it is more certainly owing to tubercular infiltration, in patches and rings, throughout the structure of the gland. The gland often remains in a stationary condition for a long time, presenting a granular yellow tuberculization, with little or no increase of vascularity, and with a permeable state of the vessels. But as the morbid deposits augment, the vascularity of the gland itself diminishes, or is gradually obliterated, owing to the pressure of the infiltrated matter, although the vascularity of the cellular tissue surrounding the gland is increased. **Bredow** considers that the vessels found early in scrofulous glands belong to the tissue of the gland itself, and not to the scrofulous deposit in it.

66. Tuberculous matter, then, is infiltrated in the tissues of a gland, organ, or part. Sometimes traces of those tissues may still be recognised in the tubercular mass. It is only in such cases that any appearance of blood-vessels can be traced, the vessels being merely those belonging to the infiltrated tissues. In other cases, the tissues, being more and more compressed by the increase of the tubercular matter, almost or altogether cease to be distinguishable, and nothing is to be found but a homogeneous mass of this matter. In some instances, the mass is isolated by degrees from the surrounding living parts, and a cyst becomes formed around it, as is formed around pus or any foreign body. Here there is a close analogy between the formation of pus and tubercular matter, either of which being infiltrated into the tissues of the part in which they are found, and afterwards becoming isolated by impacting the tissues around them into a cyst. According to **Meckel** (*Pathol. Anatomie*, 2ter Bd., 2ter Th., s. 370.), the encysted state of tubercles is more frequently met with in the lower animals than in man.

67. **Kingston**, **Thompson**, and **Lugol**, however, maintain that they have recognised blood-vessels in tubercles; but **Canstatt** remarks that **Sebastian** explains this rightly in viewing it as a mistake, arising from the circumstance of tubercular matter being sometimes deposited on a small blood-vessel without giving off a branch to this deposit. **Andral**, **Rochoux**, **Carswell**, **Canstatt**, and others agree in asserting that lymph-vessels do not communicate with the scrofulous deposit.

68. MM. **Barthez** and **Rilliet** infer— 1stly, that, when a *lung* contains grey granulations isolated from one another, an injection penetrates easily by the bronchi and by the pulmonary arteries and veins; — 2nd. That the vascular network which surrounds the granulations communicates very evidently with the pulmonary artery, and probably not with the vein; — 3rd. That the bronchial injection surrounds on all sides the grey granulation, and conceals it in part only: it is not disposed in very fine ramifications similar to a vascular lacework, but in little grains united to one another; and 4th, That perhaps the bronchial injection can penetrate the granulations. As respects the semitransparent, grey infiltration, they state that there the veins and pulmonary arteries are very penetrable by injections, whilst the small bronchi are obliterated, which latter fact is similar to what is observed in pneumonia. These observations, however, do not prove the vascularity of tubercular deposits, but rather that this deposit, as respects the lungs, often takes place in the vesicular structure or air-cells of the organ, as supposed by **Magendie**, **Cruveilhier**, **Carswell**, **Andral** and **Kingston**. That the vessels become obliterated with the progress of tubercular infiltration is contended for by **Guillot** and **Canstatt**, according to whom the tubercle itself is always non-vascular, but around the mass, or around the cavity left by it, an infiltrated layer of grey matter exists, which obliterates the vessels in the space that it occupies.

69. Dr. **Glover** remarks on this topic, that these facts and observations, taken together, lead to the conclusion of the vascularity of tubercle being a non-essential phenomenon; and that the obliteration of the vessels of the tissue into which the scrofulous or tubercular matter is effused may be carried to a greater or less extent. And it further agrees with my own observations, that the irritation produced by the infiltrated matter in the surrounding tissues may cause either increased vascularity, or in some instances obstruction of the vessels, — and that the enveloping tissue of the tubercular mass may thus be either more or less vascular or devoid of vessels; but that tubercular matter is itself non-vascular.

70. The tubercular deposit, whatever may be its seat, may be viewed as a small tumour, or tubercle, varying remarkably in size, from that of a small pin's head to that of an orange; and in colour from a greyish, semi-translucent hue to a yellowish white or greyish yellow, commonly of a round form, at first firm but friable, afterwards being transformed into an heterogeneous matter consisting of whitish, curdy masses and a sero-puriform fluid. When the tubercle is changed to this state, it generally gives rise to an ulcerous cavity, which extends more or less rapidly in every direction, sometimes remains stationary for an indefinite period, and, in much rarer cases, becomes cicatrized, or covered by a sero-fibrous lining.

71. (*b.*) Much discussion has arisen as to *the earliest recognised form and appearance* of the tubercular formation. M. **Laennec** conceived, that the white opaque corpuscle, constituting tubercle, is preceded by a greyish, semi-transparent granule, in whose centre is developed a whitish point, which by degrees extends to the surface, and involves the whole substance of the granule; so that the granule is really the first stage of tubercle. Dr. **Baron** and M. **Dupuy** believed that tubercles originate in a transparent vesicle. M. **Andral** has endeavoured to ascertain the accuracy of this opinion: and he states that it is quite certain that, in some few cases, small, round, transparent vesicles, filled with a serous fluid, are found along with undoubtedly genuine tubercles of various sizes in the lungs of the horse; but that he has never been able to find this appearance in the human subject, excepting in one solitary case. He has sometimes seen the fluid, contained in these vesicles in the horse, lose its transparency and become turbid; and the entire vesicle thus assume

the aspect of the opaque, white tubercles around it. From this M. Andral infers that the transparent vesicles found in rare cases among tubercles are only accidental productions, with which the latter are complicated; that they cannot be considered as the early stage of tubercles; and that, although they occasionally seem to secrete a matter similar to that observed in the early stages of tubercles, yet this does not prove identity.

72. M. Andral further contends that the original form of tubercle is not a serous vesicle, nor a greyish semi-transparent granule, as Laennec maintained. The opinion of this latter pathologist respecting the origin of tubercles in granulations has led to the notion, that the small, greyish, irregularly rounded bodies sometimes found studding the free surface of serous membranes, are incipient tubercles. M. Andral, however, more correctly views them as the mere rudiments of false membranes; and a similar mistake has been made in considering as incipient tubercles, those greyish granules sometimes found in mucous surfaces, which seem to be merely mucous follicles in a state of enlargement. The identity, therefore, of the granulations found in different organs and surfaces with tubercles is not proved, although those granulations are frequently complicated with tubercles, and may secrete tuberculous matter as they may secrete pus.

73. M. Cruveilhier has advanced another opinion, namely, that before the occurrence of tubercle as a hard body, and at an earlier period, it may be detected in a fluid puriform state. MM. Trousseau and Leblanc have, as well as Cruveilhier, found among well formed tubercles clusters of points, in some of which was a purulent infiltration, in others very small abscess. M. Andral has seen, in a few cases, a similar appearance; but although those facts seem to offer some confirmation to M. Cruveilhier's opinion, yet the same objection applies to it as I have already adduced. It is probable that tubercles are secreted in the fluid state, but the fact is not demonstrated; and, however small tubercles may be, they are always found in the solid state. I have observed these bodies in the lungs of very young infants, and of the fœtus at the full time — where they are extremely rare — but they have always presented the solid or consistent form.

74. It may be granted, as contended by M. Andral, that tubercles are in their first stage when they appear as minute, opaque, friable, rounded bodies of a yellowish-white colour, and without any trace of organisation or texture. But this is not the only form in which they may commence. Besides these *yellowish miliary tubercles*, there is another form, which, since the appearance of the writings of Bayle, has been the subject of much discussion, namely, *the grey, semi-transparent granulations*, which, according to Laennec and Louis, are the first degree of development of tubercle, the miliary yellowish tubercle being only a transformation of the greyish granulation. This is, in fact, confirmed by microscopic observation by Lebert. (§ 85.) The grey granulations, transparent towards their margins, and sometimes also at their centres, often show in this latter situation a point more opaque and yellower than the rest. They are not surrounded by any envelope. They do not constitute the necessary and constant origins of fully developed tubercles, but are only one of *two forms which these bodies assume at their commencement*, the yellowish miliary tubercle often commencing as such, and sometimes being a transformation of the greyish granulations. Tubercle may, therefore, at its commencement present either of these forms; or it may appear as a grey and yellow infiltration, as a gelatiniform infiltration, or as tuberculous dust, according to French pathologists. It was supposed that the grey granulations occurred only in the lungs; but it has been shown by MM. Valleix, Papavoine, Nelaton, and others, that they are found also in other organs.

75. In scrofulous meningitis grey granulations and yellow particles are observed as in the lungs. The former may also be detected in the glands, especially in the mesenteric glands, and between the coats of the intestinal canal. Barthez and Rilliet also view the grey granulation as a form of incipient tubercle, not peculiar to the lungs, but existing occasionally in other organs, as under serous membranes, in the spleen, kidneys, liver, lymphatic glands, &c. It is chiefly developed in the cellular tissue, especially that connecting serous or other membranes to adjoining parts, and is often produced by congestion or by a mechanical hyperæmia. It is not improbable that the grey and gelatiniform infiltrations of Laennec are early stages of tubercular formations. The gelatiniform infiltration may pass into a grey infiltration, and this latter into a grey granulation, which may or may not go on to the state of yellow tubercle. The tubercle-grains, whether yellow, miliary, or semi-transparent granulations, are most separated and scattered when small, or at an early stage of development. As they increase in size, they often become confluent. In the lungs more especially, they present every grade or stage both of change and development: — There are often found, even in the same subject, the grey or semi-transparent granulation, rarely alone, but usually accompanied with yellowish granulations; the small miliary tubercle, quite yellow and caseous; tubercles much larger; masses more or less softened, or even cretaceous cavities, &c. In many cases death supervenes before a large proportion of the minute greyish tubercles, or granulations, has reached more advanced phases of their growth or progress. In many instances, greyish granulations are found as the commencement of tubercular disease in one organ, and the yellowish miliary tubercle in another organ or part. It is not rare to find in young children the latter in the sub-arachnoid cellular tissue, and the former under the pia mater. Grey granulations are often found in the sub-pleural cellular tissue, and yellowish tubercles in the lungs.

76. (*c.*) *Grey granulations* are ound to possess the globules of tubercle from their earliest appearance (see the microscopic appearance of tubercles, § 81.), and may exist in every part in which tubercle has been detected. — *b.* They are not a product of inflammation, although they may be found in inflamed structures. — *c.* They are most abundant and most frequent in the lungs and in the pia mater. — *d.* They are sometimes accompanied in the lungs with a dark or melanotic secretion. — *e.* When death does not take place early, they generally pass into the form of *yellowish tubercles*, by the destruction of the fibriles which separated their constituent elements and by the

progressive deposit of the tubercular matter. — *f.* *Tubercles* do not necessarily commence in the greyish semi-transparent granulations, but also as frequently commence as yellow and opaque miliary tubercles. — *g.* In the same body both these forms of commencing tubercle are not unfrequently found, not only in different organs, but even in the same organ.

77. (*d.*) *Growth.*— Besides the transformation already stated (§ 70.), and previously to it, tubercles experience an *increase of bulk.* It seems important to ascertain how a body of the size of a small pin's head may acquire the bulk of a small orange. To account for this remarkable development, it has been supposed that this morbid production has the power of living like organised beings — of growing by intus-susception. But if this were the case, it would show appearances of organisation and vascularity : now, however large the tubercular mass may be, no trace of either the one or the other can be detected in it. We can, therefore, view this formation merely as a morbid secretion, which, having once commenced, continues; the deposition of the particles of tuberculous matter separated by the vessels from the blood increasing the mass.

78. (*e.*) The *softening* of tubercles, or the puriform transformation of them, seems to arise from the circumstance of their acting as foreign substances on the surrounding tissues, the tubercular matter exciting a secretion of sero-puriform fluid from those tissues. This fluid divides mechanically the tubercle, and changes it into the state usually termed that of softening. The tubercular matter being once secreted in the tissue of an organ or part, thus becomes, after a time, a source of irritation to the vessels of the tissue in contact with it ; and the consequence of this is the effusion of a fluid secretion which breaks down the tubercular matter. The semifluid matter thus formed tends to perpetuate and to increase the irritation of the surrounding tissue, and necessarily leads to a solution of continuity by which a way is opened for the escape of the tubercular matter, as in the case of a foreign body. But even after this has been accomplished, the morbid process excited in the surrounding texture generally continues. This theory of the softening of tubercles does not differ materially from that adopted by MM. Lombard and Andral. After the expulsion of the tubercle has been accomplished, the process of suppuration may continue, and, moreover, the same cause which had produced the tubercle before, may produce it again ; the same process which eliminated it may contribute to the renewal of its formation : so that, far different in this respect from a foreign body introduced from without, the tubercle may be indefinitely recreated simultaneously with the pus destined to produce its discharge. It has been asserted by Rokitansly, Mr. Rainey and several pathologists, that the softening of tubercles always commences at their centres : this is certainly the case in many cases ; but the process may also begin in other parts, and particularly towards their surface. When it commences in the centre, it may be imputed to a decomposition taking place in those molecules of the mass first deposited and furthest removed from the surrounding living tissues.

79. (*f.*) In rarer instances tubercles, in place of being softened, acquire unusual hardness, and are *transformed* into a firm gritty mass, in which a considerable quantity of the phosphate and carbonate of lime is found upon chemical analysis. These salts likewise exist in the softened, as well as in the early stage of tubercles, but in much smaller quantity. The transformation of the tubercles into a harder substance seems to proceed from an absorption of a considerable portion of the animal matter of which they chiefly consist. M. Thenard found tubercles, in their primary or unsoftened state, to consist, in 100 parts, of 98·15 of animal matter, of 1·85 of the muriate of soda, phosphate of lime, and carbonate of lime, with a trace of oxide of iron ; whilst those tubercles which had undergone the cretaceous transformation presented inverse proportions of those substances : that is, in 100 parts, of 3 of animal matter, and 96 of saline matter.

80. The *cretaceous transformation* occurs most commonly in those cases where the tubercles have long ceased to exert any hurtful influence on the constitution, this being the reverse of the purulent transformation. This change has been demonstrated to me in several cases, three of which occurred in medical men. I shall briefly allude to one case, as having lately come before me. A young man, about twenty, evinced symptoms of incipient phthisis, for which he was recommended to visit the Mediterranean. After being abroad for several years he returned to London in a tolerably good state of health. I attended him some time afterwards for an attack of partial bronchitis, during which he expectorated two or three cretaceous masses, evidently transformed tubercles : He recovered, travelled abroad and returned again to this country, where he continued for a considerable time in apparent health. He was afterwards attacked — about twenty years subsequently to the appearance of phthisical symptoms—by an acute disease of which he died. Upon examination, a considerable number of cretaceous tubercles were found in the lungs, which were not otherwise much diseased. We may generally infer that, when symptoms have announced the presence of tubercles, and have subsequently disappeared, the patient continuing afterwards to enjoy tolerable health, the cretaceous transformation of the tubercles has taken place. M. Andral states, that he has occasionally found, surrounding the cretaceous tubercle, a tissue that appears shrunk, and occupies less space than in the healthy state ; indicating that, in some cases at least, this tissue has actually been in part destroyed and absorbed, along with a tubercular mass, whose remains appears as a calcareous concretion. This inference is further confirmed by the fact of tubercles being sometimes found, even in the softened state, containing hard gritty particles, formed of phosphate of lime, mixed with the curdy masses floating in the puriform fluid.

81. Tubercles being produced from a morbid state — whatever kind that may be — of the nutrition, and interstitial exhalation constantly going on in the different organs of the body, it follows that they may be developed in any one or more of them. As to the particular tissue in which this morbid exhalation or secretion takes place, some doubt may be entertained. The very general diffusion of tubercles and other considerations indicate the cellular tissue, either free or

combined, as its seat; but although this tissue may be the most common, it is not the only seat of this secretion. It should, however, be stated that Dr. Baron refers it to the radicles of absorbent vessels, and some circumstances seem to support his opinion. M. Andral remarks on this topic, that "the submucous, subserous, and intermuscular tubercles are evidently developed, in the cellular tissue. It would be difficult to prove that the same holds good of tubercles of the spleen; and we can admit it only by analogy in those of the brain, liver, kidneys, testicles, and lymphatic glands." As to the lungs, we may readily detect tubercles in the substance of the cellulo-vascular tissue which forms the parietes of the air-vesicles, and the extremely small bronchial tubes opening into them. An apparently tuberculous matter, he adds, has been found in the interior of cavities lined with mucous membranes, without the presence of ulceration. This rare occurrence leads to the inference that tubercles may be secreted in other tissues than the cellular; and proves that, as they arise from a morbid state of the interstitial exhalation constantly proceeding in the different organs and tissues of the body, they cannot be referred to a single tissue or system merely, however generally diffused through the body such tissue or system may be.

82. *B.* The Structure of Tubercles as displayed by the Microscope. — The lower microscopic powers furnish but little information as to the intimate structure of tubercles; and those who have employed the highest powers differ as to the most important topics connected with this subject Even the results published at different times by the same observers differ remarkably. Thus Canstatt states, that "every trace of organised structure is wanting to tubercle-matter: vessels which have been observed in it, either belonged to false membranes developed in its bounds, or were the remains of tissues accidently destroyed." And he adds that, "microscopically observed, the peculiar fine tissue of organised bodies, growing by intus-susception and composed of cellular cytoblasts, is wanting to tubercle-matter. A mass, composed, in great part, of imperfect cells easily broken down, is only distinguished. As the tubercular deposit increases from without, the tubercle grows by apposition, and in this way increases from tubercle-molecule to tubercle-mass, formed of layers placed concentrically. The outer layers more recently deposited consist of a more transparent matter. This mode of growth forms an essential distinction between tubercle and idioplastic parasitical formations, which increase, like organised beings, by intussusception, whilst tubercle grows more like inorganic bodies." But Canstatt afterwards states that, contrary to his earlier view of cell-formation being wanting to tubercles, he has since convinced himself of the existence of cells, as Vogel describes them; and he recalls what he had formerly said about the amorphous condition of tubercle. He adds, that "Scharlan describes the tubercle grains as an accumulation of minute corpuscles about the $\frac{1}{2000}$th of a line in size, which in many situations form a dark blackish grey granulated mass; and that Gluge and Cerutti give a similar description. The observations of Kuhn as to the papillary appearance of tubercle under the microscope, rest on an illusion. The peculiar bodies, described by Gruby in tubercular sputa, as consisting of whitish-yellow lenticular, round, or oval corpuscles, from one to ten times larger than pus-corpuscles, of a darker yellow, and of concentric layers, are not confirmed according to others, and appear to have been a misconception. Tubercle consists, at its commencement, according to I. Vogel, of an amorphous mass, which almost disappears in acetic acid, and even in ammonia, and in which the rudiments of cell-formations are already found; this mass gradually passes wholly into tubercle cells, of very different sizes, from the $\frac{1}{80}$th to $\frac{1}{400}$th of a line, and of different forms." Vogel further states that these cells are either rounded, or oval, or long, or drawn out, tailed, or string-like, irregular, &c., with very pale walls, with nuclei which are larger in the small cells, smaller in the larger; and that they often contain fat granules, or granules of dark pigment. The walls of these cells become more transparent, or wholly disappear by means of acetic acid, whilst their nuclei remain unchanged. Both the cells and the nuclei are destroyed by ammonia. Vogel, notwithstanding, agrees with Vetter in considering that, although the presence of cellular bodies is proved in tubercles, these bodies may be distinguished from the usual formative cytoblasts; the organic elements found in tubercles being rather the rudimentary portions or altered remains of other tissues, than independent bodies.

83. The individual corpuscles of tubercle are, according to Ruette, composed of an integument and a nucleus; and are rather larger than blood-globules. Bredow says that he could find no integument to the corpuscles. Scherer found the firmer or outer portion of tubercle to consist of a multitude of little granules and nuclei mixed with a few irregular larger cell-granules; but no fibrous structure, nor free fat corpuscles. The softened inner portion contained nuclei of granular corpuscles which were as large as the round nuclei of the more solid outer part. Gerber asserts that tubercles consist almost entirely of granules, from $\frac{1}{2000}$th to $\frac{1}{200}$th of a line in diameter; but that, with the granular matter, nucleoli, nuclei, or cells are mingled in a quantity in proportion to the amount of fibrin which the exuded fluid contains.

84. Mr. Gulliver states in his edition of Gerber, that tubercular matter consists "chiefly of irregular corpuscles and cells, with oblong and circular nuclei;" and that it is "void of regular structure, being composed of shapeless fragments, and a granular matter formed of minute spherules very variable in size." In Mr. Phillips' work he is quoted as follows: — "In the human subject, it appears to me that crude tubercular matter, from whatever organ obtained, differs as little in its microscopical, as in its general and chemical characters. When examined by the aid of the microscope crude tubercular matter can scarcely be said to present any regular structure, as it is merely made up of minutely granular matter, oily spherules, some shapeless albuminous flakes, or shreds, and a few irregular corpuscles; the latter are probably nothing but effete, or shrunken primary cells." (p. 41.)

85. M. Lebert remarks that tubercles present microscopical elements proper to themselves, and distinguishing them from all other morbid pro-

ducts. In this respect they obey the general law, that all existences which are really different pathologically, differ also in respect of molecular composition. Tubercles, according to M. Lebert, contain a great quantity of molecular globules varying in diameter from $\frac{1}{1600}$th to $\frac{1}{800}$th of a line, a hyaline substance which unites their elements, and a species of corpuscle which gives them a peculiar character. These corpuscles are of irregular angular form, vary in diameter from $\frac{1}{200}$th to $\frac{1}{300}$th of a line, and generally present a well defined edge, Their interiors are yellowish, slightly opaline, and often contain molecular granules distributed through their substance: they never contain true nuclei, which are so common in cancerous globules, and so constant in those of pus. Acetic acid, which renders the latter transparent, and displays nuclei within them in a very distinct manner, renders the tuberculous corpuscles also more transparent, without disclosing true nuclei in them. If water be added to the tuberculous corpuscles to make them float, their form is seen to approach that of an irregularly polyhedral sphere, instead of being flattened like the globules of pus or cancer. They are numerous, and present so many super-imposed layers in the best microscopical preparations, that it is necessary to have observed them repeatedly, and with a clearly defining magnifying power of from 400 to 500 diameters, in order to acquire an accurate notion of their characters.

86. The ordinary element of tubercle, according to Dr. Glover, in whatever situation this deposit may occur, is the granular corpuscle. "Many tubercular masses are composed almost wholly of this matter, which varies in size, from about the bulk of a blood-globule to about, perhaps, $\frac{1}{10000}$th of an inch in diameter. These corpuscles are generally of a somewhat yellowish colour; and when magnified by the highest power (610 diameters), show, occasionally, spots in their substance, which may possibly, in some cases, be nuclei." Mixed with these, which he believes to be in some instances altered cells, in other cases new formations, there are the following elements: —1st. Epithelial scales, variously altered, observed in lung-tubercle; 2nd. Fat globules; 3rd. Crystals of salts; 4th. Portions of the destroyed tissues, which sometimes assume singular shapes; 5th. Cells, which also appear to belong to the old tissues; 6th. Large granular and corpuscular masses of the most irregular forms. The description of tubercle by Dr. J. Hughes Bennett has been adduced at another place. (See Scirrhous and other Growths, § 71.)

87. Microscopical examinations of tubercle and scrofulous matter have also been made by Mr. Dalrymple, and published by Mr. Phillips, as follows: — "The whole material is composed of disintegrated tissue; granular molecules; irregular exudation corpuscles, in which the nucleolus is seldom to be recognised; and a considerable quantity of oil globules, which may be abstracted by boiling in æther, and recovered by evaporation on a plate of glass."

88. The following remarks of Mr. Dalrymple are *diagnostic of tubercular matter*, inasmuch as they distinguish this matter from the *pus-globule*, and from the exudation-corpuscle: — "In acute or chronic inflammation of the *glands, in otherwise healthy subjects*, in whom no particular morbid disposition exists, the *exudation corpuscle*, by what appears a law of vitality, proceeds to the development of a cyst around the nucleus or cytoblast; and this nucleus even splits into two or more, and hence a *pus-globule* is formed. At this point, however, the process stops, and the pus-globule subsequently disintegrates, and is resolved into granular and fluid matter. During the development of the cell and fissure of the nucleus, a pus-globule may be said to be an organic and vitalised body, deriving its means of increase from the blastema around.

89. "The *exudation corpuscle*, however, is capable of a much higher degree of organisation; and, under favourable circumstances, the cell-germ produces its cell; the cell elongates, and either fibre or filament is produced, as in the healing of a wound.

90. "In *scrofulous matter* it appears that the exudation corpuscles do not possess even that feeble power which induces the further change into pus, and therefore it passes from the nucleolated cytoblast into an irregular granular body (disintegrated), the elements of which, by some further chemico-vital process, resolve partially into oil or fat globules." (p. 40.)

91. *C.* The Chemical Composition of Scrofulous and Tubercular Matter. — M. Simon remarks, that chemical analysis has hitherto thrown very little light on the nature of *tubercle*, or on the mode of its formation. A tubercular mass, analysed by Preuss, contained 19·5 of solid constituents, and 80·5 of water, the former were composed of a substance resembling casein in its relations towards acetic acid and heat, a fat containing cholesterin, and a very small quantity of salts. Scherer, according to Dr. Day, states that crude pulmonary tubercle yielded little fat or extractive matter, showing that the morbid process was not far advanced. An ultimate analysis, after the most careful removal of salts and foreign constituents, gave: —

Carbon	53·888	Which corresponds with the Formula C 43, H 35, N 6, O 13.
Hydrogen	7·112	
Nitrogen	17·237	
Oxygen	21·767	

Hence tubercle in a crude state may be regarded as *protein* (C 48, H 36, N 6, O 14), from which five atoms of carbon, one of hydrogen, and one of oxygen, have been removed. Scherer has made several other analyses of tubercles from different parts of the body; but they differ as little as, and sometimes less than, the above from the composition of protein. (See Dr. Day's Transl. of Simon's *Animal Chemistry*, vol. ii. p. 480, &c.)

92. Gueterbock has also analysed tubercles from the neck, from the bronchi, and from the lungs; and he states that they contain, — 1st. Albumen in small quantity; 2nd. Pyine differing from casein; 3rd. Phymatine, a species of osmazome, which, according to him, is proper to tubercles, and which is soluble in water and in alcohol, is precipitated by the acetate of lead, but not by galls, nor by the solution of the sulphate of copper; 4th. Fatty matter, not only cholesterin, but also saponifiable fat. As to Phymatine, a principle which Gueterbock says is proper to tubercles, its existence requires to be proved by other analyses. Tubercular matter has been chemically examined by Boudet, Hecht, and

others, but the analyses of PREUSS and SCHERER appear to be most satisfactory; and to them M. LEBERT has given the preference.

93. ii. THE BLOOD IN SCROFULA AND TUBERCLES has been long considered popularly, and with much truth, to be of a poorer quality than in healthy constitutions. SIMON states, that the blood is deficient in solid constituents, especially in fibrin and in corpuscles. The primary causes are probably due to a deficient formation of chyle, and to the influence of a most unhealthy atmosphere. According to DUBOIS, the blood of scrofulous subjects coagulates slowly, the clot is small, soft, and diffluent; the serum is thin, and often a reddish colour. Under the microscope, some of the corpuscles appear devoid of colour at the edges only, some entirely colourless. Their size is not materially changed, but they appear flattened, spherical or cylindrical. Hence he infers that there is a deficiency of the salts in the blood of scrofulous persons. Mr. PHILLIPS remarks that, in every case in which he examined the blood of scrofulous subjects, the coagulum was relatively small, the serum large; the clot unusually soft, almost diffluent; in a few instances only, it was tolerably firm. In most cases the proportion of globules was considerably under the healthy standard. The fibrin had not generally undergone much change. He states that there was in most instances a considerable increase in the proportion of albumen and of the salts, the latter being in some cases nearly double.

94. The state of the blood now mentioned certainly exists, as far as my own observation has extended, especially the deficiency of red globules and the increase of albumen. I have not found any diminution of the salts; but the fibrin has varied with the state of vascular action, an increase of this action and the association of inflammatory action with the scrofulous or tubercular lesion augmenting the quantity of this constituent. As external scrofula becomes more and more chronic, and as suppuration or ulceration continues, the blood becomes more watery and poor, the red globules diminish, and the clot is more soft. These results are also observed during the advanced stages of internal tubercles, as shown more fully when treating of *Tubercular Consumption.* The changes in the blood are well described in Dr. GLOVER's work on Scrofula, to which I refer the reader.

95. iii. THE STATES OF THE SECRETIONS AND EXCRETIONS in scrofulous and tuberculous persons have not been satisfactorily investigated; and unless in protracted and in the most severe cases, they probably do not present any very obvious changes from those usually observed even in healthy persons.—(*a.*) The frequency of a fatty state of the liver in persons who have died of scrofulous disease or of tubercular consumption, has been imputed by some to a deficient secretion of bile, and to the circumstance of the *bile* containing a much less quantity of its fatty constituents, which are not separated from the liver by means of its secreting function. But the changes, whatever they may be, which exist either in the liver, or in the bile, or even in the chyle, are to be imputed chiefly to the previous alterations of organic nervous energy, to the state of the blood, especially in respect of the amount of red globules, and to the amount of function performed by the lungs.

96. FISCHER and DISSE contended, that scrofulous persons suffer from disordered states of the gastric secretions; and the existence of a specific scrofulous dyspepsia was not only asserted, but minutely described, by certain recent writers, who considered this supposition not merely a remarkable distinction, but as an important discovery. That the gastro-intestinal secretions should be changed more or less from the healthy condition throughout the course of scrofulous and tubercular affections, cannot be doubted. Organic nervous power, upon which secretion, assimilation, and nutrition are chiefly dependent, is more or less impaired in scrofulous constitutions; and hence the digestive and related functions must necessarily be co-ordinately disordered, whenever the usual causes of disorder of these functions are in operation. As organic nervous energy is more and more weakened, and as the blood becomes thinner, or poorer, or more watery, owing to the consequent impaired digestion and assimilation, the usual phenomena attending these states of disorder may be expected to appear from even the slightest causes.

97. (*b.*) The state of the *urine in scrofula* has been investigated by CANSTATT, DISSE, and GLOVER, but they have remarked no definite change in this excretion when the urinary organs are not especially implicated, and when the functions of the skin are not materially disturbed. When, however, these functions are either impaired, or arrested, or, on the other hand, much increased, the urine is generally vicariously changed accordingly, not merely in quantity, but also as respects its ingredients; much, in either respect, depending upon the nature and amount of the ingesta.

98. According to SIMON, the urine of children of the scrofulous diathesis differs in the majority of cases from the normal state. It is usually pale, but becomes deeper coloured when there is vascular excitement. Its specific gravity is lower than in health, and it is often much more acid than the urine of children usually is. SCHÖNLEIN states that the principal changes in the urine of scrofulous persons consist in the diminution of the nitrogenous constituents — the urea and uric acid, and in the appearance of the non-nitrogenous oxalic acid, and occasionally, but more rarely, of benzoic acid. The acids are frequently so abundant, that the urine, upon cooling, deposits copious sediments of the oxalates, and these sediments sometimes form renal and vesical calculi. The frequent occurrence of oxalate of lime or mulberry calculus in children is well known. Dr. PROUT has remarked, that half the stone-cases occur before the age of full puberty.

99. iv. THE PATHOGENESIS OF SCROFULA AND TUBERCULOSIS. — *A.* The operation of the causes above described, either singly or in succession, or more or less in combination, is manifestly such as tend *to weaken the organic nervous energy,* and thereby to depress the digestive, the assimilating, the nutritive, and consecutively the depurating or excreting functions. The organic nervous system actuates these several functions, and is itself influenced by the physical agents which perpetuate animal existence,—by external agents, and by the ingesta. The causes which have been now

considered, whether those acting on the parents of the scrofulous subject, or upon the scrofulous individual himself at a very early age, or even at later periods — whether external, or internal — whether hereditary, congenital, or acquired — have all a similar tendency, namely, directly to depress, or to exhaust organic nervous or vital power; and thereby to impair vital resistance, to prevent the processes of repair consequent upon morbid vascular action, and to arrest the formative or organising tendency of the exudations produced by this action. Not only is there a disposition to a dyscrasy — to a solution of vital cohesion, observable in parts the seat of scrofulosis, but there is also an absence of the formative effort in the fluids exuded by morbid actions in scrofulous constitutions. The state of vital power or endowment in the several tissues or organs of scrofulous persons, appears insufficient both for the healthy or sthenic actions or functions these parts should perform, and for the organisation of the fluids or matters effused from their vessels. Hence the changes which the exuded matters undergo, neither favour, nor are followed by, organisation even in its lower grades; and, most probably the fluid itself is exuded from the capillaries of a kind and in a state which indisposes it to organisation. It consequently undergoes changes independently of any formative tendency, these changes being chiefly those of increase by aggregation of the tubercular molecules, until the irritation produced by the morbid deposit affects the enclosing tissues, and thereby favours the progressive changes produced in this deposit, as mentioned above (§ 78.).

100. It must be manifest, that, admitting the more immediate and direct operation of the causes of scrofula on the organic nervous system, and through this system upon the functions which it actuates, the *blood* itself necessarily must be, sooner or later, or even from an early period of the action of these causes, most materially altered; and thereby become furnished with the elements of the morbid materials, or even with these materials themselves, which are deposited in certain parts in preference to others, owing to the states of organic nervous, or vital power in these parts. That the blood is actually so changed is not very demonstrable in many instances, especially early in scrofulosis, or where the scrofulous taint only exists; but that it is more or less changed, in the majority of instances, even in these, is made evident by careful inspection and by chemical analysis, the secretions and excretions ultimately becoming more and more altered. It has been repeatedly shown, that not only is organic nervous power more or less weakened, but the blood also is manifestly thinner, or poorer as respects the amount of red globules, and even otherwise altered. Thus the *organic nervous influence* in the first place, and *the circulating fluids* in the second place, are the *prime factors* of both the scrofulous taint, and of the more diseased grades of this taint, as manifested by external or internal tuberculosis.

101. *B. The origin and source of scrofula and tuberculosis* may be readily inferred from what has been advanced above as to their *causes*, and as to the *operation* of these on the organic nervous power, on the digestive and assimilative functions, and upon the blood and vascular system generally. When it is considered, that the state of the circulation in the capillaries, the changes of the blood in them, and the exudations which take place from them, are controlled most remarkably by the organic nervous influence, it will be admitted that to this influence or power the primary morbid change should be imputed; and that, in whatever tissue or part this power is the most impaired, or most languidly exerted, or most depressed by external or physical causes, or by internal ingesta, or most affected by hurtful agents, in these tissues, parts, or organs will this primary change of nervous power affect the capillary circulation as respects not only the state of the capillaries themselves, but also as regards the conditions of the blood they contain, and of the exudations from them. Whilst, therefore, the *origin* of the scrofulous taint may be ascribed to the organic nervous system, and to its influence upon the digestive and assimilating functions, the *source* of the morbid deposit may be traced to the state of the blood, and to the exudation which takes place from the capillaries in the seat of lesion.

102. *C.* The *nature* of the changes constituting scrofula and tuberculosis, must be manifest from the character of the causes which produce these changes primarily in the organic nervous system, and consequently in the assimilating functions and in the blood itself. These changes are, as respects this system, a state of depression, or of weakness, or asthenia; as regards the assimilating functions, a state of impairment or insufficient action; as respects the blood, a deficiency of red particles, and an increase of albumen; and as regards the capillary circulation, a languid condition, amounting to congestion in some organs or parts, and varying in grades of passiveness, and occasioning an exudation or deposit of the morbid matter of tubercle in the tissues, whose capillaries are thus more especially affected.

103. v. As to the state of Vascular Action producing Tubercles, much discrepancy of opinion exists. There are, however, three well-ascertained facts connected with the origin of these bodies, calculated to lead to an accurate opinion on the subject:—1st. Their frequently simultaneous formation in different organs; 2nd. The very frequent absence of any appreciable symptoms of antecedent excitement, increased action, or congestion of the capillaries of the part in which they originate; — and 3rd, their very general origin in states of the frame remarkably characterised by deficient vital energy and by imperfect development; and consequently upon *causes*, as shown above (§ 99. *et seq.*), which, as respects both the parents and the offspring, depress or exhaust vital power and sthenic action, and impair the assimilating and nutritive functions.

104. *(a.) The presence of tubercles in several organs at the same time* has been explained by supposing that the tubercular matter has been absorbed from the original seat of its formation, introduced into the circulation, and re-secreted or deposited in the parenchyma of other organs, the case being the same with tubercular matter as with pus. I will not deny the possibility of this occurring; but there is no decisive proof of it. Besides, this can hold good only with regard to the consecutive formation of tubercles, and not in respect of their simultaneous occurrence in distant organs. It would be more consistent with the close observation of the phenomena of their origin to refer the

latter, and even the former mode of their production to defective vitality of the capillaries, and to a modified state of the exhaling function these vessels are constantly performing in the different structures; this function being modified by the defective state of vital endowment of those vessels. The general diffusion of this primary morbid condition — this constitutional taint — will account for the simultaneous, as well as for the consecutive affection of several organs; the varied conditions of the textures and organs occasioning the diversities which are met with in respect of frequency of liability of each, the succession of attacks, and various other peculiarities occasionally met with.

105. (*b.*) *The Localisation, or the Origin of Tubercles locally, has been ascribed to inflammatory action* by several pathologists. M. Broussais (*Exam. des Doct. Méd.* T. i., prop. 168.) said that he had never seen tubercles in the lungs without antecedent inflammation; and Dr. Alison, in some very able papers published between 1820 and 1830, supported a nearly similar doctrine. This enlightened physician concludes, "that scrofulous tubercles may be, and often are deposited in consequence of inflammatory action; and therefore, that as, on the one hand, scrofulous diseases may be, in many cases, prevented by applying the *tonic regimen* to persons of feeble constitution, but not yet affected with actual disease; so, on the other, they may also be frequently prevented by the early and prudent use of the *antiphlogistic remedies* in those in whom the slight inflammatory complaints so often preceding them have already appeared."

106. *In opposition to the inflammatory doctrine of tubercles,* M. Bayle, who has directed much attention to this formation in connection with pulmonary consumption, has expressed himself very decidedly. He contends, that tubercles are never an effect of inflammatory action, not even in its chronic form; and M. Laennec observes, that extensive observation proves, that the development of tubercles results from a general disposition of the frame, that it takes place without previous inflammation, and that when inflammatory action co-exists with tubercles, it is generally posterior to them in date. Moreover, the simultaneous occurrence of tubercles in nearly all the organs in the body, is opposed to the doctrine of their origin in inflammation. According to M. Louis, inflammatory action, in some cases, influences the production of tubercles, and, in other cases, it seems to take no part in their formation. He further remarks, that inflammation and tubercles occasionally co-exist without being necessarily dependent on each other; and that tubercles may be developed in the lungs independently of inflammatory action of any grade, whether in the parenchyma of the organ, or in the mucous membrane of the bronchi. A similar opinion has been published by MM. Leveillé and Rostan. In addition to the argument derived from the *post-mortem* appearances, I may state, that in no class of the human species are tubercles more frequently met with than in negroes and other dark varieties of the species, particularly when they are removed to a colder climate than that of which they are indigenous; and yet inflammatory diseases are seldom observed amongst them. Whoever has had occasion to observe the character of morbid actions in these races, must have remarked their immunity from inflammation, and their general liability to diseases of a very opposite character, particularly to those attended with diminished vital energy, and to tubercular deposits.

107. MM. Andral, Lombard, Cruveilheir, Becker, and Schroeder Van der Kolk, entertain a doctrine intermediate between the foregoing — an opinion not far different from that espoused by Dr. Alison, but leaning less to the inflammatory doctrine of the disease. They, however, admit the occasional origin of tubercles in a state of inflammatory congestion of the capillaries, preceded and accompanied by a constitutional disposition to tubercular productions. M. Cruveilhier, in his conclusions from the experiments, wherein he produced, artificially, miliary tubercles, by injecting fluid mercury into the veins of dogs, considers that these bodies are formed in consequence of a stasis of the fluid in the capillaries followed by a morbid secretion.

108. The opinion offered by M. Gendrin appears accordant with extensive observation of the causes, phenomena, and results of tubercular disease in man and the lower animals, and agrees with the experience I have had of this disease, particularly at the Infirmary for Children. This able pathologist states, that tubercles, during the whole of their early stage, are entirely independent of every form of inflammation; and that it is not until they begin to soften that the tissue surrounding them begins to be inflamed, this tissue then secreting a fluid which aids in dissolving the dense matter composing them.

109. It may be inferred, from an intimate view of the tubercular formation, that it consists of an exudation of a matter essentially different from that which is produced by inflammatory action; and that it proceeds from a modified state of the exhalent process constantly existing in living structures, owing to a weakened state of the vital endowment of the capillaries in the seat of the disease. The coagulating lymph produced by inflammation affecting the healthy constitution is susceptible of organisation; the concrete matter forming the tubercular secretion is entirely insusceptible of this process, the changes which it undergoes being chiefly the result of decomposition, and of the admixture with it of the fluid exuded by the vessels of the tissue immediately surrounding it. Accompanying inflammation, of whatever grade, attacking the sound or untainted constitution, there is always a disposition to organisation of its products; but in tubercular disease an opposite tendency obtains, — the capillaries exude a fluid, undergoing changes in which this vital process has no share, and inducing irritation and disorganisation in the parts in contact with it. In the former state of disease, the vital endowment of the capillaries is exalted, and an emanation of it serves to organise the inflammatory products; in the latter this endowment is diminished, and insufficient to prevent either decomposition of the matters secreted by it, or disorganisation from the slightest causes of irritation.

110. As to the opinion which refers tubercles *to irritation in the organ* in which they are seated, little need be said, especially as the abettors of this doctrine have failed to define the meaning they attach to the word irritation, and even leave it uncertain whether they apply the term to the nerves, or the extreme vessels of the part, or to

both. Even those who confine the term to the extreme vessels, leave us to doubt whether the terminations of the arteries, or the radicles of the veins or of the lymphatics, are its seat, and to puzzle ourselves with conjectures as to in what particulars irritation of a capillary vessel differs from inflammation, or whether it differs at all or not. Taking it, however, for granted, that those who espouse the doctrine of irritation, mean by the term an excited state of the capillaries, giving rise to augmentation of their organic action, but falling short of acute inflammation, it may be remarked, that neither the symptoms by which this state is recognised during life, nor the effects it induces in the tissues, are altogether similar to those produced by tubercles. It is true that tubercles, when once they are formed, occasion irritation in the tissues surrounding them; but this is an effect, and certainly not a uniform cause, of their formation. It is possible, also, that irritation, in any of the acceptations of the word, may sometimes occasion the development of tubercles in an organ; but this result will never take place unless with the concurrence of other causes, many of them proper to the constitution of the individual, or at least pre-existent to irritation; for wherefore should tubercles result from this vaguely supposed state, rather than from any other of the numerous changes to which it is so generally supposed to give origin, if it were not because other pre-existent and concomitant influences caused tubercles to be formed in preference to any other morbid production or lesion.

111. The arguments which have been here stated in opposition to the opinion that tubercles proceed from irritation of the capillaries in the part in which they are formed, apply with still greater force to the idea of their origin in inflammation. After every consideration I can give the subject, I would infer that tubercles originate in a modification of the nutrient and exhalent functions constantly going forward in the organic structures, owing to defective vitality of the capillaries; and that when irritation, or inflammation, or congestion occur, they are either accidental and concurrent causes, or effects resulting from the accumulation or decomposition of the morbid exhalation in the particular form constituting tubercular productions. But this local morbid condition is only a part of a more general constitutional vice, manifested not only by the organic nervous energy, but also by the digestive, assimilative, and circulating functions, and even by the state of the blood.

112. vi. OF THE IDENTITY OF SCROFULA AND TUBERCLES. — This topic would not have required discussion, if several authors of repute had not disputed the identity of those morbid conditions, more especially SCHARLAN, SCHÖNLEIN, DR. EVANS, DR. CHAPMAN, and MR. PHILLIPS. DR. GLOVER has ably reviewed the arguments which these writers have urged in support of the differences between them. But the operation of similar causes, hereditary, parental, and exciting; the appearance of both forms in the same family, and even in the same individual; the same diathesis, constitution, and states of the blood and secretions, and a similar grade of vital endowment, of vital cohesion, and of vital resistance, characterising both diseased manifestations; the same tendency to dyscrasy, and the same indisposition to the healthy restoration of parts in both; and the same principles of treatment, and even the same agents and means, being the most successful for the cure of both forms of lesion, are circumstances which so manifestly show identity, that an opposite doctrine cannot with due reason be supported. The differences which have been urged, moreover, do not invalidate the doctrine of the identity of these states of disease; they have reference merely to difference of seat, and of epochs of life during which the one is more prevalent than the other.

113. But the great question, the solution of which ought to put an end to all discussion, is this, — Is the morbid structure of external scrofula identical in its characters with that of internal scrofula, or tuberculosis? or, in other words, Is the external manifestation of scrofula by enlarged lymphatic glands the same in its minute structure as the internal manifestation of it by tubercular deposit? Preliminary to the answer which I shall give, I should state that scrofula is a term which may be, and has been, given to a diathesis—to a constitution—to a certain appearance, described above (§ 5. *et seq.*), and which may exist without any manifest external or internal lesion — without any special disorder, although often accompanied by some internal affection usually denominated scrofulous. Now, this external affection, whatever it may be, most commonly, however, seated in the lymphatic glands, is, as respects the morbid change, the same as that found in other or in internal parts, no further differences being observed than such as necessarily result from difference of seat. DR. GLOVER remarks (and others have stated the same, both before and after he wrote), that the only difference which he has been able to detect between tubercular matter and the degenerated substance of scrofulous glands, is in the existence of a greater number of bodies presenting the appearance of thickened and translucent or opaque cells in the latter case. But the microscopic elements are in both instances the same. The results of chemical analysis also point out the identity of the two kinds of formation. M. LEBERT, whose researches into the intimate nature of scrofula and tuberculosis are most minute, patient, and trustworthy, states that the tubercular deposit in scrofulous lymphatic glands is the same as in other organs (vol. i. p. 534.).

114. CANSTATT remarks, that the material and physiological causes of scrofula and tubercle, their progress, &c., scarcely leave a doubt of their identity; nevertheless respect for those who entertain a different opinion, suggests an inquiry into the force of their arguments: — *a.* They urge the difference of form between scrofulous formations and tubercle, the former being often indeterminate, the latter more rounded or provided with an envelope. But this is chiefly owing to the structure of the tissue in which the deposit occurs. In some cases, the lymphatic glands present in their interiors, cysts filled with tubercular matter, comparable with isolated tubercles; and I may add, that the differences, as respects the great tumefaction of scrofulous glands and of their surrounding tissues, depend chiefly upon the nature and structure of these glands, and upon their connections, not only with the vascular system, but also with the lymphatic vessels belonging to them, and with the adjoining cellular tissue.

115. *b.* It has been asserted, that while scrofulous glands may be injected, tubercles show no vessels in their structure. But the injection of these glands does not prove the injection of the tubercular deposit in them; this deposit, whether taking place in them, or occurring elsewhere, being without vessels, excepting such as belong to the tissue in which it is found.

116. *c.* The incurability of tubercular formations in the lungs has been adduced as a proof of difference between external scrofula and tuberculosis. But tubercles, in the lungs or elsewhere, may heal as well as the forms of external scrofula, and according to similar processes. Scrofulous formations, like tubercle, may pass into calcareous masses, or thus degenerate; or they may be thrown off by ulceration, or their suppuration and the deposit of a reparative tissue may be followed by cicatrisation. The chief circumstances which prevent internal tuberculosis from healing so frequently as the external malady, are the causes inducing the former, the frequently continued operation of these causes, the nature of the structures affected, the constant action of the atmosphere as respects tuberculosis of the lungs, as well as the other lesions which often precede, accompany, or follow this morbid formation.

117. *d.* It has been contended that, because persons below puberty are most frequently the subjects of external scrofula, and those more advanced in life are most subject to tubercular consumption, therefore there is a difference between them. But, as I have shown above, tubercles may occur at any age, however early, and are, in fact, very common in young children, whilst external scrofula may also be developed at any age; and it may be added, that open external scrofula before puberty does not prevent tubercular formations in internal parts subsequently. Tubercles may exist, in an early stage, both internally and externally in the scrofulous diathesis, and whilst concurring causes may develope the external malady, the internal may remain latent, or be but imperfectly manifested, or may appear long subsequently, or even not at all, if the causes usually determining the development of this lesion are avoided. Of 312 scrofulous children, only 47 were found without tubercles in the lungs. Lugol remarks that scrofulous children have always tubercles in the lungs. This inference is too general; but I have seldom inspected the body of a child who has died of a non-tubercular disease, and who manifested the external signs of scrofula, without finding internal tubercles in one or other stage of development.

118. *e.* It is almost unnecessary to pursue the subject further; but one argument frequently urged is, that either form of the disease may run in families without the other form being met with. This statement is, however, pushed beyond the truth. Such an occurrence is not very frequent, nor are the exemptions contended for either complete or many. Portal considered both scrofula and phthisis identical, yet he admitted that either may be transmitted in families in preference to the other. Dr. Holland remarks that "in the scrofulous temperament, even more than that of gout, we have a remarkable diversity in the forms of the disease and the organs it attacks." I readily agree with Dr. Glover in remarking that, in respect of this topic, "on the one side all is clear, pathological and decided, founded on facts of essential relation; while on the other side we have doubtful assumptions, and at best non-essential relations."

119. vii. DISEASES ATTACK THE SCROFULOUS DIATHESIS WITHOUT BEING ESSENTIALLY SCROFULOUS OR TUBERCULAR, ALTHOUGH MORE OF LESS INTIMATELY ALLIED TO EITHER.—Not only may several diseases attack the scrofulous diathesis without being essentially tubercular; but this diathesis may predispose to them, and render them more chronic and difficult of cure. Thus, while I believe in the identity of scrofula and tubercles, I consider the latter as a development or manifestation of the former, arising out of one or more of the causes above described; and further infer that various local affections, more or less resembling or allied to scrofula, may occur, either in delicate persons, especially in cachectic children, who are not of a scrofulous taint, or in those who are actually scrofulous, without being necessarily or actually scrofulous, or attended by external or internal tuberculosis.

120. 1st. *Various Affections are occasionally met with in delicate or cachectic subjects, which are not truly scrofulous in their nature*, but which, when occurring in this diathesis, are influenced by it, as stated hereafter (§ 125.). It is not uncommon to observe in delicate or cachectic children, chronic inflammations, especially of the periosteum or bones, to follow slight injuries, or other affections to follow slight causes, without any essential characteristic of being scrofulous. Various chronic affections of the skin, of the mucous membranes, or of the joints, or of the eyes, may also appear in these subjects, without presenting the scrofulous elements, although they most frequently do present them when occurring in the scrofulous diathesis.

121. 2nd. *Other Affections still more nearly allied to scrofula may take place in this diathesis*, and yet be without any very manifest tubercular formation. Parts may become inflamed, go on to suppuration or ulceration, and present no further scrofulous characteristic than the long duration of the disease and indisposition to cicatrisation. Caries of the bones, chronic ulceration of the skin, consequent upon eruptions, eczema, lupus, &c.; ozæna, various states of gastro-enteric irritation or inflammation, diseased follicular glands, prolonged leucorrhœa, chronic bronchitis, affections of the eyes and eyelids, flexures and other diseases of the spine, enlargement of the joints, softening of the structures, &c., are very common in the scrofulous diathesis, without being attended by tubercles; and although not strictly scrofulous, are more or less allied to it when occurring in this diathesis.

122. 3rd. *These affections, however, are often attended or followed by tuberculosis* either of adjoining glands or of internal viscera, especially in the scrofulous diathesis; the occurrence of these appearing to complicate, or to develope the tubercular deposit. On the other hand, the tuberculosis may have existed previously and been followed by either of those, which, in some instances, when allowed to proceed, or when accompanied by a discharge and by appropriate treatment, may supersede, or partially or altogether subdue, the tubercular malady.

123. The affections now mentioned, whether occurring in the scrofulous diathesis, without manifest external scrofula, or internal tuberculosis, or complicated with either external or internal scrofula, are most frequent and most obstinate in persons whose powers of life are constitutionally low or exhausted, and the vital cohesion or tone of the tissues are originally weak or otherwise impaired. They may occur, in this state of the frame, either independently of true scrofula or tuberculosis, or in an intimate association with tubercular deposits in some part or parts of the body — they may exist without tuberculosis, or they may be associated with it, although not necessarily depending upon it. They ought, therefore, not to be considered as varieties of scrofula, but should be separated from this affection; inasmuch as, although they are often met with in the scrofulous diathesis, they frequently also occur in weak constitutions or exhausted states of the frame, in which this taint, or any actual manifestation of tuberculosis does not exist.

124. viii. The Scrofulous Taint, or Tubercular Constitution, necessarily predisposes to, and influences the Course and Termination of, other Maladies. — However obvious and important this assertion may appear to many, and however frequent the observing and truly scientific physician may have had occasion to remark this influence, to regard its results, and to modify his practice accordingly, still the facts which this proposition comprises have too often been either altogether unrecognised or at least partly unheeded. The states of vital power and resistance throughout the frame, the conditions of the circulating and secreted fluids, and the vital cohesion of the tissues, of scrofulous and tubercular persons, are generally such as to predispose them to several maladies, and to modify the course and terminations of most of those which may afflict them.

125. *A. As respects the predisposition which this taint occasions*, it may be remarked that it is the most influential when no open or external manifestation of scrofulous disease has appeared; for when such disease is developed and is proceeding, internal or constitutional maladies are less apt to occur, or supervene only after the more energetic operation of their exciting causes. The external affection, especially when attended by a discharge, has often the effect of a derivant, and sometimes becomes a safety-valve to the economy in circumstances which might otherwise be attended by risk, as when exposed to the causes of endemic, epidemic, or constitutional disease. In other circumstances, especially when the morbid taint is present, without any active or developed external disease, the constitutional powers are too languid — too feeble, to resist the invasion of causes and the production of effects, which would have been successfully resisted by more powerful energies; and the causes of disease, especially such as are depressing and contaminating, would make more rapid, more marked, and more dangerous impressions and changes in the scrofulous constitution, than in any other. Experience furnishes many proofs of the truth of this position. Local injuries, such as bruises, contusions, concussions, the impression of cold, infectious and epidemic agents and influences, contagious and contaminating miasms and secretions, &c., are less successfully resisted by scrofulous persons than by others; and when the effect is produced by either of these, or by other causes, it is generally either more marked or more prolonged, and remedied with greater difficulty. The full development of the predisposing and exciting causes of disease which I have attempted under a different head renders it unnecessary to remark further on this topic, at this place, than to recal attention to its importance (see art. Disease, § 18. *et seq.*).

126. *B. The Course and Termination of many Special States of Disease are very remarkably modified and aggravated by the scrofulous taint.*—(*a.*) That this is more especially the case in respect of *Inflammations* is generally admitted; but there is every reason to believe that the evil is not confined to this class of diseases. As regards inflammations, it may be remarked, that not only are they rendered more chronic in the scrofulous diathesis, although the acuteness, the severity, or the activity of these maladies, is seldom so great as in the vigorous and healthy constitution, but their consequences are more dangerous, both as respects the changes produced in the structures affected, and as regards the state of the products of inflammation. In the strumous diathesis, softening, infiltration, tubercular deposition and disorganisation of the inflamed structures readily take place; and restoration to the healthy condition is either very slowly or imperfectly accomplished. The fluids effused are much less prone to assume a state of partial or complete organisation than in the healthy constitution, but they are more disposed to undergo changes of a more injurious nature — to assume a dirty curdy or cheese-like appearance, or a tubercular character, or to become the nidus of further changes. It would appear as if the products of inflammation in the strumous diathesis proceed from a lower grade of vital action, than in healthy constitutions; and that, whilst these products in the latter cases are more prone to organisation owing to a certain degree of derived vital endowment, those resulting from scrofulous inflammatory action are much less prone to this change, owing to this endowment being so much less as to be altogether insufficient for this end. The inflammatory products in scrofulous persons are thus not only different from those in healthy constitutions, even at the moment of their formation, but they become still more different after their exudation, owing to the partial absorption or exhalation of their more watery constituents, to the aggregation of their albuminous, mineral and other elements, and to the consecutive irritation they produce in the surrounding or containing tissues.

127. (*b.*) In all *fevers* also, especially such as are malignant or infectious, softening of mucous and cellular parts, ulceration of the intestinal mucous surface and follicular glands, effusion from internal surface, and disorganisation from loss of the vital cohesion of the structure, especially in parts which are pressed upon, or are irritated by external agents, more readily and more remarkably supervene in the scrofulous, than in the healthy constitution. In all acute and chronic inflammations or congestions of the *brain*, *lungs*, and their *membranes*, reparation is delayed, more difficult, or is imperfect; and either effusion, or tubercular depositions, with their various unfavourable concomitants and consequences, are much more apt

to supervene in the scrofulous than the healthy constitution.

128. (*c.*) The influence of scrofula is less manifest in aggravating the course of other diseases, than in originating many, both of a functional and of a structural kind. All those maladies which present a tubercular character, and several of those which consist of adventitious formations, or chiefly of alteration or vitiation of the nutrition of a part, may not only, in a great measure, proceed from this diathesis, as regards some cases, but also be aggravated or even altogether transformed as respects other instances. But it is unnecessary to pursue this topic further at this place, as it, as well as several allied topics, are more fully discussed in the articles DEBILITY, DISEASE (§ 87. *et seq.*), INFLAMMATION, and in other parts of this work.

129. IX. THE ASSOCIATED ALTERATIONS AND COMPLICATIONS OF SCROFULA AND TUBERCLES. — From what has been stated above, almost every tissue or organ of the body may be the seat of tuberculosis; but there is a very wide difference in the frequency of the occurrence of this lesion in different organs or parts (§ 135.). I have stated, with respect to the *pathogenesis* of scrofulosis or tuberculosis, that there are modifications of organic nervous power, of capillary vascular action, and even of the blood itself, which are necessary preludes to the alteration in the textures especially affected; the local change being chiefly characterised by congestion of the capillaries and the exudation or deposit from the blood, constituting the tubercular matter (§ 109.). External scrofula most unequivocally presents itself in the form of enlarged or diseased lymphatic glands; and as respects them, it has been asked by an able writer, Mr. PHILLIPS, "Is this state of the gland determined by the circulation within it of blood which has undergone change, or is it independent of the blood? Does the blood fit the organ to receive the deposit, or does the organ fit itself? This is an important question, but of very difficult solution. Important too, with reference to treatment; because, if the action set up were purely local, means might be taken to change it and render it unfit for the deposit. If the action depend only upon a general contamination of the blood, how comes it that all the lymphatic glands are not equally affected? It is notorious that they are not."

130. But the alteration of the blood here insisted on, is only one part of the morbid condition, and, as respects the succession of changes producing this condition, a more or less advanced part. These changes have already been stated (§§ 101. 109.), and it has been shown, that the constitutional changes — the changes in the organic nervous power, in the capillary circulation, and in the blood itself consecutively upon the state of assimilative function, are such as tend to predispose the lymphatic glands, as well as various other textures, to experience these changes in a more manifest degree, especially upon the operation of various causes, whether constitutional or local, whether depressant or irritant, and to favour the supervention of further changes in the capillary circulation of these parts, and ultimately to produce the exudation in them of the materials constituting the tubercular deposit.

131. The cause or source of the swelling and hardness presented at an early stage by external scrofulous glands, has been a topic of discussion. This has been ascribed to increased vascularity in the first instance, and to the morbid exudation in the second. This is probably the case; but it is not so manifest, that the vascularity is owing to increased action: it is more probably the result of interrupted circulation — of congestion, not merely of the blood in the capillaries of the gland, but also of lymph in the proper lymphatic vessels of the organ, aided more or less by an exudation of molecules or tubercular materials or elements from the congested capillaries, which materials are incapable of organisation, and which, by their aggregation, become more and more manifest, as shown above (§ 109.). As these accumulate they often change the capillary congestion which partly occasions them, to inflammatory irritation, followed by the usual products of inflammatory action; and thus a state of simple congestion of the glands, induced in a constitution such as I have described, is converted, by the material exuded from the congested capillaries and by the irritation this material occasions, into a state of inflammatory congestion, with all the consequences of this state in its more chronic forms. It should not, however, be admitted that the swelling existing in these cases is altogether owing to the changes within the gland itself; for much of it arises from congestion, increased vascularity, and serous effusion in the cellular tissue surrounding the affected gland. The greater tendency also of the external glands to become enlarged and ultimately even inflamed, in connection with tubercular deposits in them, may be ascribed to the greater exposure of these glands to physical influences and agents, and to local or external irritants, affecting not merely their state of vital power and action, but modifying also the condition of the blood circulating through them.

132. A careful examination of a scrofulous cervical gland by Mr. DALRYMPLE is thus described in Mr. PHILLIPS's work:—"This enlarged gland appears to consist of a general parenchyma in a state of chronic inflammation, surrounding irregular masses of yellowish white matter, more immediately the subject of examination. In direct proximity to the edges of this white material, the blood-vessels are seen to be more enlarged and congested than elsewhere, and in some parts the capillaries are occluded with coagulated blood. The parenchyma, which at first sight appears healthy, is, on examination with high power, found to be infiltrated with exudation corpuscles, resembling lymph globules. The natural texture of the gland consists of its proper corpuscles, filamentous tissue, blood-vessels, lymphatics, and nerves. In this morbid specimen, everywhere is the filamentous tissue infiltrated, and its fibres separated by innumerable exudation corpuscles, and the proper corpuscles of the gland are similarly surrounded and imbedded. As the parenchyma is nearer to the whitish matter, so proportionally do the proper corpuscles of the gland become more indistinct, the filamentous tissue more obscure, the blood-vessels irregularly dilated and filled with red globules, and they at last disappear insensibly. The exudation corpuscles are more numerous, but irregular in size and shape, and interspersed with minutely granular matter." (p. 45.)

133. *A.* The *modifications and associations of scrofula and tuberculosis* are to be ascribed chiefly

to the pre-existence or association of various grades of capillary congestion, sometimes passing into chronic inflammatory irritation, in the seats of the tubercular exudation. But it may be asked whether or not this exudation ever occurs without these antecedent states of congestion or of inflammatory irritation? There is no sufficient reason to infer that this deposit may not take place without either of these alterations of local vascular action; for miliary tubercles and grey granulations are often found in tissues, the capillaries of which present no material alteration. It may, therefore, be inferred, that tuberculosis may appear — 1st, Independently of locally increased vascular or capillary action; 2ndly, Consequently upon capillary congestion; 3rdly, In connection with inflammatory irritation, or inflammatory congestion, of the part; and, 4thly, Where the inflammatory diathesis is associated with the scrofulous, or where tuberculosis is associated with inflammation of a sub-acute or chronic kind. Whilst, however, either of these states of local vascular action may precede or accompany the morbid deposit or exudation constituting tubercles, it is not improbable that this deposit as often becomes the cause, as shown above (§§ 110, 111.), of the vascular disorder, inducing such disorder where it has not previously existed, and increasing or developing it where it had already commenced.

134. *B. The Complications of Tuberculosis* are so diversified that a particular notice of them cannot be given at this place. It must be obvious, that the state of constitution described above to constitute the scrofulous diathesis, will favour the occurrence of various disorders, both without or independently of any tubercular deposit, and in more or less intimate association with it. It has been shown (§ 123. *et seq.*) that the scrofulous taint favours the occurrence of several diseases not actually scrofulous or tubercular, and that it modifies the course and termination of others; and various affections have been enumerated above (§§ 119—121.), as being met with in delicate constitutions, which are not scrofulous, in the scrofulous diathesis without evidence of tubercular deposits, and in this diathesis complicated with these deposits in one or more organs. A knowledge of such occurrences, either as now stated, or as particularly noticed above, is sufficient to suggest the chief indications of treatment which these associations will require in respect of their individual forms.

135. x. The Comparative Manifestations of Tuberculosis — *A.* As to the comparative frequency of tubercular formations in the different organs of the adult body much interesting information has been adduced by MM. Louis, Lombard, and Andral. — *(a)*. The lungs hold the first place, in respect of frequent liability to the disease: next, the small intestines. M. Louis found (leaving the lungs out of the calculation) in 358 adult subjects, tubercles in the small intestines, in a *third* of them; — in the great intestines, in a *ninth*; — in the mesentric glands, in a *fourth*; — in the cervical glands, in a *tenth*; — in the lumbar glands, in a *twelfth*; — in the prostate, in a *thirteenth*; — in the spleen, in a *fourteenth*; — in the ovaries, in a *twentieth*; — in the kidneys, in a *fortieth*; — in the uterus, in *one case* of them only; — in the cerebrum, in *one case*; — in the cerebellum, in *one case*; — and in the ureter, only in *one case*. There was no account taken, in those cases, of the occurrence of this production in the testicles or in the bones, which is not uncommon. Out of all of them M. Louis found only one case in which tubercles were found in different other organs without existing in the lungs.

136. In one hundred *adult* subjects, Dr. Lombard found, not counting the lungs, tubercles in the intestines in 2 cases; — in the mesenteric glands, in 19; — in the bronchial glands, in 9; — in the cervical glands, in 7; — in the spleen, in 6; — in the lumbar glands, in 4; — in the sub-peritoneal cellular tissue, in 4, — in the maxillary glands, in 3; — in the glands of the anterior mediastinum, in 3; — in the sub-arachnoid cellular tissue, in 2; — in the spinal chord, in 2; — in the false membranes of the pleura, in 2; — in those of the peritoneum, in 2; — in the intercostal muscles, in 2; — in the ovaries, in 2; — and in the parietes of the gall-bladder, in the liver, cavity of the pleura, posterior mediastinum, vertebræ, ribs, omentum, uterus, prostate, sub-mucous tissue of the bladder, cerebrum and cerebellum, medulla oblongata, kidneys, and vesiculæ seminales, *one each*.

137. M. Andral states that his observations as to the relative frequency of tubercles in the different organs of the body, observe nearly the same order as that indicated above, excepting that he has found, in more cases than M. Louis, tubercles in other organs without detecting them in the lungs. He has also discovered them in the false membranes of the pleura and peritoneum in a greater proportion of cases than M. Lombard. M. Andral has found them in the intervertebral cartilages in one case; and he adds very interesting information respecting the relative frequency of tubercles in the different organs of children.

138. *(b.) Tubercles, in Children*, more frequently affect a number of organs at the same time than in adults. They occur more commonly, in this class of subjects, in other organs, without existing in the lungs. It will, moreover, be seen, from the following results furnished by M. Lombard, that the parts most commonly affected in adults are not altogether those which are so in children. In a hundred *young* subjects he found tubercles in the bronchial glands, in 87 cases; — in the lungs, in 73 cases (in 30 of which, but one lung was affected, viz. the left in 13, and the right in 17 cases); — in the mesenteric glands, in 31 cases; — in the spleen, in 25; — in the kidneys, in 11; — in the intestines, in 9; — in the nervous centres, in 9; — in the cervical glands, in 7; — in the membranes of the brain, in 6; — in the pancreas, in 5; — in the gastro-hepatic glands, in 5; — in the sub peritoneal cellular tissue, in 5; — in the spleen, in 4; — in the inguinal glands, in 3; — in the cellular tissue under the pleura, in 2; — in the lumbar glands, in the sub-mucous tissue of the bladder, in the omentum, in the parietes of the gall-badder, and in the false membranes of the pleura, *one case* each. It may be remarked that, in these hundred cases, tubercles were not found in the liver in a single case; and in all the cases of adults the liver contained tubercles in one case only.

139. M. Papavoine found, in 50 children in which the seat of tubercles was ascertained, 49 in which they existed in the bronchial glands; — 38

in the lungs;—26, in the cervical glands;—25, in the mesenteric glands;—20, in the spleen;—17, in the pleura;—14, in the liver;—12, in the small intestines;—9, in the large bowels;—9, in the peritoneum;—5, in the brain;—3, in the cerebellum;—3 in the cerebral membranes; — 3, in the pericardium;—2, in the kidneys;—1 in the pancreas, 1 in the vertebræ; 1 in the stomach. In 10 instances tubercles were present in the bronchial glands without having been found in the lungs. The relative frequency of tubercles in the abdominal organs is very different in M. Papavoine's table from that furnished by M. Lombard. The above show that they are more frequent in the bronchial glands of children than in the lungs; whilst in adults the proportion is much greater in the latter, than in the former. Besides, in this class of subjects, they are seldom met with in these glands without being observed in the lungs; but they are often found in adults, in the lungs without there being any in the glands.

140. *B.* As to the relative Frequency of Tubercles at the different Periods of Life, without reference to the organs in which they are seated, the following inferences may be adduced:—1st. Tubercles are very rarely developed in the fœtus; but several instances have occurred to me, particularly in the lungs of those whose mothers were suffering from phthisis during gestation:—

141. 2nd. During the first months after birth, tubercles are likewise rare. In the lungs of an infant (attended by Mr. Nicholson of Davies' Street and myself) born of a mother far advanced in consumption, affected with cough from the moment of birth, and that died instantly from profuse hæmorrhage from the lungs under three months, the lungs were so studded with tubercles, many of them large and softened, as not to collapse upon opening the thorax. Tubercles existed no where else. This state of disease in so young a subject was rare, and the nature of the result still rarer.

142. 3rd. From nine months to five or six years, tubercles are very frequent. According to M. Lombard, tubercles are found in only one-eighth of the children who die between the ages of one and two; in two-sevenths of those between two and three; in four-sevenths of those who die between three and four years of age; and in three-fourths of those who die between the ages of four and five years. From my experience at the Infirmary for Children, I am of opinion, that M. Lombard calculates the proportions as too high in respect of children between the ages of three and five, and too low in respect of those below two years. However, the results may vary somewhat between London and Paris. There can be no doubt of the fact mentioned by this writer, that at the age of four or five years a greater number of organs are simultaneously affected with tubercles, than at either an earlier or later period of life. I believe that these tubercles begin to form about the period of dentition and weaning, the change which is then made in the diet of infants, being the chief cause of their formation; and that the fatal effect most commonly does not occur until about the fourth or fifth year.

143. 4th. From the sixth to the sixteenth year tubercles are much less frequently met with, than from the third to the sixth, but they occur more frequently than under the age of two years. The results which I have stated in the preceding paragraphs differ much from those furnished by M. Lombard. But they are in many respects confirmed by the researches of M. Papavoine made at the Hospital for sick Children, at Paris. This physician found, in 408 children under fourteen years of age affected with tubercles, 73, or $\frac{1}{5}$-$\frac{1}{2}$, under two years; — 64, or $\frac{1}{6}$, from two to three years of age; — 46, or $\frac{1}{9}$, from three to four; — 35, or $\frac{1}{12}$, from four to five;—32, or $\frac{1}{13}$, from five to six;—29, or $\frac{1}{14}$, from six to seven;—24, or $\frac{1}{16}$, from seven to eight; — 16, or $\frac{1}{25}$, from eight to nine; — 18, or $\frac{1}{23}$, from nine to ten;— 12, or $\frac{1}{31}$, from ten to eleven; — 24, or $\frac{1}{16}$, from eleven to twelve; — 10, or $\frac{1}{41}$, from twelve to thirteen, — 11, or $\frac{1}{40}$, from thirteen to fourteen; and 14 whose ages were not ascertained.

144. 5th. After puberty tubercles again become more frequent, but only as regards the lungs, the intestines, and some parts of the lymphatic system, especially the lungs. Does this increased frequency arise from the new source of exhaustion which comes into action in the development of the genital organs? I think that it does. According to M. Andral, males are particularly subject to tubercles between the ages of twenty-one and twenty-eight; whilst females are more subject to them before the age of twenty. After these periods, tubercles are much less frequently met with until from about the 38th to the 45th year in females, and from about the 40th to the 55th year in males, when a slight increase is again remarked, particularly in females.

145. *C.* As to the Comparative Liability of the Sexes, it has been generally admitted, that the female is more frequently the subject of tubercles than the male sex, and this certainly holds in respect of children. But according to the data furnished by M. Lombard, the difference of liability of adults is extremely small. He states, that in 52,857 persons who died of tubercles in the lungs, 26,124 were males, and 26,733 females. M. Louis, however, found the proportion of adult males to females affected, to be 70 to 92. M. Papavoine considers the difference to be still greater between the two sexes, in children. According to the returns of the Registrar General the proportion of deaths by tubercular consumption is about 24 males to 28 females.

146. *D.* With reference to the Occurrence of Tubercles in the Lower Animals, M. Andral observes, that "several animals have, in common with man, the tendency to tuberculous affections. Amongst the mammalia, animals using the most different kinds of food are equally subject to these affections — the carnivorous as well as the herbivorous. Amongst the carnivorous, however, there is one species, in which, though we frequently examine their bodies, genuine tubercles have never been discovered: I mean the canine species. Is this because the dog lives in freedom in a climate that agrees with him, and where he can enjoy exercise in proportion to his strength? And is it because the lion happens to be in opposite circumstances, that he dies in this climate affected with tubercles? Most of the animals in which we have proved the existence of this affection, are either transported from a hot to a cold climate, where they are deprived of liberty and

exercise (as is the case with monkeys and parrots), or confined in damp places, without sun, and almost without air (cows, pigs, house-rabbits), or exposed either to continual alternations of heat and cold, or to constrained and violent exercise, as the horse." The want of due ventilation, or a too frequently respired air, a too hot or close, or a too cold and humid atmosphere, and the close confinement so opposite to the habits of these animals, are not without their influences.

147. xi. Are Scrofula and Tuberculosis more prevalent now than formerly? This question hardly can be answered in the present state of knowledge, as the data on which rational speculation respecting it, either are altogether wanting, or are of so loose a kind as to prevent the possibility of arriving at a sound conclusion on the subject. Mr. Phillips has indeed entertained this topic, but with reference chiefly to external scrofula, or the "King's evil," as so denominated in former times. The principal data he has adduced are the loose reports of the bills of mortality of former years, and the numbers said to have received the royal touch during the reign of the second Charles. It is obvious that no conclusion can be drawn from these respecting the comparative prevalence of the several forms of tuberculosis in former and recent times. A careful consideration of the relative influence of the principal causes of scrofula in past ages and at the present day, may suggest vague ideas on the subject; but as certain of these causes were, perhaps, more influential formerly than now, whilst other were less so, and whilst some have even recently come into operation, others have nearly or altogether disappeared, the question must be viewed as not admitting of solution, however important the considerations which it involves.

148. IV. The Prevention of Scrofula and Tuberculosis. — It is obvious, that the *prevention of a constitutional taint*, which is not limited to the individual thus tainted, but which is very commonly propagated to his offspring, in some one or other of its forms or contingent effects, is much more important than even the cure of these effects when they come under the eye of the physician; and it is equally obvious, that the prevention consists in the avoidance of the causes producing this taint — these causes being fully exposed above (§ 13. *et seq.*), with the implied object of enabling the medical adviser, or whoever is concerned in the matter, carefully to avoid them — this avoidance having reference to the parent or parents, and to the offspring for successive generations. By no class of diseases are the misconduct, the imprudence, and the want of judgment of the parents more severely punished than by this — by none so distressingly, hopelessly, extensively, and successively, until the tainted race is almost or altogether extinguished. Instances illustrative of the misery — of the numerous miseries — resulting from the thoughtless, the ignorant, the worse than culpable intermarriages of scrofulous persons, or even by the marriage of a healthy person with one who is thus tainted, crowd upon my recollection, and are too common — too well known to every one who may read this — to require enumeration. The subject is sufficiently illustrated by the calm consideration of every thinking mind.

149. Several of the causes which I have discussed above, require only to be known to be guarded against, and certain of them may readily be avoided by careful persons. Others cannot be avoided by those most concerned, or who are about to become their victims; but they may be altogether removed by those who have the power of inflicting them. Richly endowed public institutions or schools may be so managed, and have been so managed, as to become hot-beds for the generation of scrofulous or tuberculous diseases. The same remark often applies to private as well as public schools, and not merely as respects food and clothing, but also as regards ventilation, exercise, light, sunshine, and purity of air. The constitutions of the industrious poor are sacrificed on the altar of gain, and governments lend their aid to the immolation, that they may receive the unrighteous support of the priests of mammon in perpetuating their power, their patronage, and the aggrandisement of their satellites. The physical and moral ameliorations, which salutary measures would impart to those most in want of them, cannot be afforded out of the luxuries and patronage which aristocratic governments bestow on their supporters and themselves. The inevitable tendencies of extreme taxation and of an immense national debt are to reduce the middle classes to the lowest, to render the poor still poorer, more wretched and more debased, to augment the wealth and the influence of capitalists and contractors, to render these last more dishonest and overreaching; and, as the general result, to multiply beyond calculation the chief sources from which scrofulous and tubercular maladies, the physical curses of society, derive their origins. Dishonesty, moreover, in professions, trades, and the several relations of life, — the necessary consequence of the foregoing — is daily increasing and leaving its victims physically and mentally reduced, thereby favouring still more the invasion of the most hopeless forms of the maladies under consideration. These are results which are manifest to the common-sense thinker, however they may be controverted by political economists, and by political and statistical haranguers, who will prove or disprove whatever may suit their arguments, their purposes, or their motives, and even bring an array of figures and numbers to their support, without caring for the accuracy of the amounts which they thus imposingly marshal.

150. *The Hygeienic Treatment of Scrofula* should, however, not be limited to the careful avoidance of the causes above described, whenever this object can be attained; but be extended to the use of such rational means as may prevent the full development of the scrofulous taint, and of its consequences, in those who may evince it in any grade, in childhood or infancy, and more particularly in the children of scrofulous parents. If this latter *indication* be carefully pursued, and if judicious means be employed, much may be accomplished, especially if the tainted subject be early submitted to these measures. As respects the *infants* of scrofulous parents, hygeienic treatment should be adopted as early as possible. If the taint exist on the mother's side, a wet-nurse of healthy constitution, and suitable as to the state of her milk, should be procured; and if this be impossible, ass-milk immediately upon being drawn from the animal, or goat's milk may be given. Recourse may otherwise be had to milk

expressed through a bag containing suet, as advised by Dr. Paris. Great care, especially as respects food and clothing, should be taken of the child at the periods of dentition and weaning. At these epochs, especially the latter, ass-milk, milk boiled with suet—cod-liver oil, or sweet oil, on the surface of the milk — small doses of liquor potassæ, or of Brandish's alkaline solution, or of the iodide of iron, in the syrup of sarza, especially in older infants or children—salt-water bathing, the temperature being adapted to the strength of the child—and warm flannel clothing over the whole body, are the most beneficial hygeienic means.

151. The support of animal warmth, and the animal heat derived from a young healthy nurse, are most beneficial to delicate, and more especially to scrofulous infants, and the more so the younger the child. An emanation of organic nervous power, as well as of warmth, may be furnished from this source to the delicate infant. The lower animals afford this protection to their young until growth is considerably advanced; and yet the young animal which is most helpless in infancy, and requires this the most, is the oftenest deprived of it, or is allowed to remain no longer in the bosom of its nurse than when it is suckled. During the coldness or coolness of night, and often in a chamber much below the usual temperature of the sitting apartment, the infant is often allowed to sleep in a cot altogether apart from the curtained and warmer bed of the nurse.

152. Change of air, or the migration from one locality to another, according to the circumstances of the case, the age of the patient, and the season of the year; removal from crowded towns or situations; residence near the sea-coast, in a temperate and dry air, and on a gravelly or sandy soil; sea-voyaging in some cases; sleeping in large airy chambers; exercise in the open air, the enjoyment of light and sunshine during the waking hours, and limiting sleep to the hours of darkness, are generally of great service, especially in advanced childhood, and during the progress to puberty. Cold-bathing, particularly sea-bathing, frictions of the surface, a generous diet, with a due proportion of animal food, and regular meals, are also most beneficial in the early periods of life. Whilst these means are pursued, the digestive and assimilative functions should be promoted, whenever they are insufficiently performed, by stomachic and tonic aperients, as the compound decoction of aloes, with the compound steel mixture, or the compound infusions of gentian and senna; and the use of unnecessary stimuli or stimulating beverages, of pork and indigestible meats, of sugar and saccharine substance, should be avoided.

153. As puberty advances, the utmost care should be exercised in all matters which may affect the sexual feelings or desires. A proper superintendence of both sexes ought to be instituted, in order to prevent the tendency to masturbation, which is greater amongst scrofulous constitutions, at this epoch of life, than in others; and which, if practised at all, will certainly develope this diathesis into actual tubercular disease, especially tubercular consumption. A careful supervision should also be exercised, after puberty, in order to prevent attachments being formed between scrofulous persons, or between an individual of this diathesis and one who possesses a healthy constitution. This intention, however, will frequently fail; but where it is attempted amongst the well-informed classes, and the evils consequent upon the neglect of it are duly explained by members of the profession, it will receive attention, and the good results will ultimately become apparent.

154. V. The Medicinal Treatment of Scrofula and Tuberculosis. — The medicinal treatment of scrofula consists, — 1st. In aiding the hygeienic or regimenal treatment above discussed, when the scrofulous taint is suspected or apparent, especially in early life; — and 2nd. In employing such medicinal agents as are most likely to arrest the progress of the mischief when scrofula or tuberculosis is more or less manifest. In the first case, medicines are chiefly brought in aid to hygeienic means; in the second, they are the principal agents, regimenal means being aids to their operation.

155. i. *In Scrofulous Cases devoid of any very manifest Local Lesion*, in connection with the hygeienic means now mentioned, various medicines possessing an alterative and tonic influence may be used. One of the earliest indications of scrofulous taint is furnished by the weak state of the digestive functions — a state evidently caused by the low condition of organic nervous power; and hence occur indigestion, flatulency, acidity of the prima via, irregular state of the bowels, torpid function of the liver, and consecutively a poor or thin state of the blood. Formerly small doses of blue pill, or of grey powder, with soda or other antacids were given for these, conjoined with stomachic aperients and tonics; and very frequently with marked benefit, which, however, was very often counteracted by the excessive use of sugar and saccharine substances, the injurious influence of these either being not known in these cases, or overlooked. This treatment, first advocated by the truly greatest name in medicine of his day — by Mr. Abernethy — was afterwards advocated by his pupil, Mr. Lloyd; and is still one of the best that can be adopted; and has been employed by myself in numerous cases with marked advantage and variously modified. Two grains of grey powder, with one or two of dry carbonate of soda, or four or five of magnesia, with rhubarb and powdered cascarilla or cinnamon, taken once or twice daily, according to the features of the case, were generally most beneficial.

156. In cases which present increased frequency of pulse, with or without the disorder of the digestive functions, the use of the above means, modified to meet the circumstances of the case, will be advantageously assisted by small doses of either the infusion or the decoction of cinchona, with the solution of the acetate of ammonia, sometimes with the ammonia in excess, and the sweet spirits of nitre; or the infusion of cinchona may be given, with moderate doses of the hydrochloric acid and hydrochloric ether. In cases where aperients are required, and when a pill may be taken, Plummer's pill may be given at night with soap; and the citrate of magnesia, or the phosphate of soda, in some pleasant vehicle in the morning.

157. On the other hand, when, with disorder of the digestive organs in scrofulous subjects,

there is more or less languor of the circulation and of the frame generally, Dr. GRIFFITH's myrrh mixture — (one of the most valuable medicines in existence) — with the compound decoction of aloes, when the bowels require aid, sometimes with the addition of the solution, or of the carbonate, of potash and extract of conium, &c., will then be found most serviceable.

158. Since the introduction of *Iodine* into practice, there has been no other substance so generally employed as it has been, in some one or other of its preparations, and especially in the form of iodide of potassium. It has superseded the use of mercury even in the combinations mentioned above; and certainly when prescribed in small doses, as I have usually done since 1821, and in conjunction with the solution, or the carbonate of potash, with the mixture just mentioned, or with a tonic infusion, or with some preparation of sarza, it is a valuable remedy; but it is one that may prove injurious if it be given in too large or frequent doses, or insufficiently diluted, or if its effects are not carefully watched in all cases.

159. Where scrofula is suspected or manifest by its taint, rather than by developed disease, other means may be employed, either alone, or in aid of those already noticed, and one of the best, both as a nutrient and as an alterative, is the *Cod-liver oil.* When it is prescribed in full doses for the age of the patient, an alterative mercurial pill or powder may be taken occasionally at night (§ 155.), and an aperient in the morning, in order to promote the functions of the liver and to prevent biliary accumulations; and in cases where the debility is marked, and the surface is pallid and the structures flabby, the use of this oil should be aided by the preparations of iron, or it may be taken on the surface of water containing a few drops of the hydrochloric tincture of iron.

160. In cases of scrofulous taint conjoined with much debility, as well as in those presenting manifest external or internal tuberculosis, various modifications and combinations of the above means may be brought in aid of hygeienic measures. The alteratives may consist of a combination of mercury and of iodine, or of iodine and iron, with preparations of sarza, or with tonic infusions, according to the features of the case, and whilst these are being employed at suitable periods of the day, the cod-liver oil, or vegetable tonics, or bitters, may also be taken. But, in these, the several means, already advised, both for the prevention of the further development of the malady and as regimenal treatment, should not be neglected, according as the peculiarities of the case may suggest.

161. In some cases of external scrofula, when there was a languid circulation, more benefit has appeared to accrue from the internal use of the muriatic or nitric acid, or the nitro-muriatic acids, prescribed in an infusion of cinchona, than from any of the preparations of iodine; whilst in others, a course of two or three weeks of the former has been alternated with a similar course of the latter, with obvious benefit. In some instances also, the muriated tincture of iron, conjoined with an increased proportion of the acid, or with the hydrochloric æther, has been prescribed with the infusion or tincture of calumba or quassia, with even greater advantage than either of the preceding.

162. A combination of small doses of the bichloride of mercury, with the compound or simple tincture, or the decoction of cinchona, or with the preparations of sarsaparilla, has been long recommended both for the scrofulous taint and the more declared forms of tuberculosis; and I have frequently had recourse to it, in one or other of these forms. In non-febrile cases, or where a tonic is required, this combination is often eminently beneficial; and a course of it is generally very advantageously followed, or alternated, by one of either of the preparations of iodine, as already advised (§§ 158. 160, 161.).

163. ii. The *Medicinal Treatment of the more developed States of Tuberculosis* is not materially different from that already recommended; but there is generally required a more appropriate application of the means already mentioned, as well as of others about to be noticed, to these states — to the particular forms and seats of tuberculosis. When the malady affects external parts, as the lymphatic glands, the joints, the bones, &c., then the medicines above advised, more especially those last mentioned, will be found in general most serviceable; and in these the cod-liver oil may also be taken. When the mesenteric glands seem to be chiefly diseased, the preparations of iodine should be given in very small and much diluted doses; and this oil may also be brought to their aid; frictions over the abdomen with oleaginous and stimulating liniments (*Form.* 306. 311.) being additionally resorted to.

164. When the glands go on to suppuration, or when a discharge is furnished by them, or when external sores, fistulæ, &c. appear, then strict attention should be paid to the digestive and assimilative functions, and more especially to the states of the circulation and of the blood. Not only should the former functions be aided or corrected as advised above (§§ 155, 156.), but the blood should be improved whenever it appears to be thin or poor in red globules, by means of the preparations of iron; and of these, the judicious use of the compound steel mixture, or of the iodide of iron in the syrup of sarza, has proved most beneficial in my practice. In all scrofulous cases attended by suppuration or discharge, there is a marked tendency to alteration of the blood — to a state of anæmia, particularly as respects the coloured globules; and hence these medicines are the more required. In all cases also of open scrofulous sores, care should be taken to prevent as much as possible the access of the air to them; as the air not only injuriously affects the diseased surface, but it also alters the discharge from this surface, and renders it more irritating. Local applications, therefore, in these cases, should be employed with the view not merely of removing the morbid action of the part, but also of completely excluding the air, and of correcting the acrimony of the discharge.

165. When scrofula, in any of its open forms, attacks *females*, it is often *complicated* with either a delay of the catamenia, especially about or soon after the period of puberty, or with irregularity of some kind, or an entire suppression of this evacuation. In many instances an obstinate form of leucorrhœa accompanies the catamenial disorder; and not infrequently the scrofulous, as well as the sexual, disease has been induced or aggravated by the baneful vice of masturbation. Due atten-

tion should be paid to this causation, and to this morbid association, as due inquiries on the part of the physician, and a careful supervision by the friends of the patient, may be productive of ultimate success in the treatment, which in general should be chiefly constitutional.

166. In some cases it will be found advantageous to commence the treatment of scrofula, especially when it is internal, or the glands are chiefly implicated, and the tongue is loaded, with a smart emetic, of sulphate of zinc, and to promote the emetic operation by means of the tepid infusion of chamomile flowers; and, having subsequently improved and promoted the secretions and excretions by the alteratives and stomachic aperients already mentioned (§§ 155—157.), to enter upon a course of either of the more energetic medicines as advised above (§§160—162.). When the scrofulous affection is seated in a gland, and has gone on to suppuration and fluctuation, the integuments being thinned and purplish, there can be no doubt as to the propriety of procuring the discharge of the matter by a small incision of the integuments, and of afterwards protecting the orifice from the air. In cases of this kind, as well as in those attended by open sores, the state of the constitution, particularly as respects the blood, should receive attention; and the treatment ought to be especially directed to the improvement of the assimilative powers, and of the blood, whenever they are in fault, either by the means already noticed, or by the other vegetable or mineral tonics generally in use.

167. Whenever any sexual disorder *complicates* the scrofulous taint, or any form of tuberculosis (§ 165.), as will be frequently observed in practice, meddling examinations, *per vaginam*, should not be instituted without sufficient reason. Most of these disorders will yield to the treatment advised for them severally, under their respective heads in this work, especially when conjoined with the medicines found most serviceable in scrofulous and tubercular affections. Indeed the general indications and means of cure most appropriate to the one class are very frequently suitable to the other; and this remark need not be limited to the constitutional treatment, but be extended to the local also.

168. After the operation of an *emetic*, when it is required, the alvine secretions and excretions ought to be duly promoted by a combination of *stomachics* or *tonics* with *aperients* and *alteratives*, due regard being also had to the diet and regimen recommended above (§ 150. *et seq.*). As occasion may offer, the *mineral springs* and *baths* about to be noticed (§ 193. *et seq.*) may either be brought in aid of other internal or constitutional remedies, or may follow the use of these latter, or even be alternated with them.

169. iii. Of the several Means recommended for the Cure of Scrofula and Tubercles. — When a person possessed of common sense hears of the numerous spells, charms, incantations, superstitious rites, &c. so frequently had recourse to in former days for the cure of scrofula, he considers them humiliating proofs of the credulity of the human mind, during ages commonly called dark, or only partially enlightened; and he is induced to form a comparison between those ages and present times, and to draw inferences which will probably be by no means in favour of the former. Superstitious and absurd notions and practices were no more then, than they are now, confined to the lower classes of society, or to the uninstructed mind: and however lowering they may appear to the dignity of human nature, however irrational and impossible the results imputed to them may seem to the thinking, however devoid of those connections which entitle the imputed causes to the credit of the reported effects, when any effect was even loosely observed, still greater absurdities, still more wonderful charms, more entrancing spells, more blind superstitions, and more gross impositions are credited, in this age of boasted civilisation, of scientific advancement, and of mechanical contrivance and invention, and more numerous instances of blind credulity are daily manifested, than in ages of the darkest and lowest mental abasement.

170. Everywhere — in all ranks and classes, in all professions, and even among those reputed to be instructed, or learned, or even embued with science — most absurd doctrines connected with the healing art, human impossibilities, the most ridiculous notions, the most extravagant assertions, are promulgated by knavish impostors, and believed in by credulous multitudes; the impudence of the former and the faith of the latter being the greater, the more devoid of truth these doctrines are, and the more they are opposed to good sense, to true science, and to honest dealing. When we find, as may be found at the present day, in the senate, in the hierarchy, in the judicial bench, — amongst those who govern the country, who interpret and administer the laws, who profess to direct the religious belief of the community, not merely believers in, but also propagators of, the most absurd medical doctrines and medical means — officious meddlers in what they are incapable of understanding — abettors of the knavery of mischievous quacks — can the decadence of true medical science be far off? What is neither honoured nor rewarded must necessarily cease to be sufficiently, ardently, and patiently cultivated. If the impertinencies of the ignorant, the impudence of the vulgar, the professions of the uneducated, are to be esteemed above the acquirements of the scientific and philosophic investigator, there must, at no remote period, be an end of the learning and science of those who shall hereafter assume the office and rank of physician.*

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* It is very generally believed that the patronage of quacks and quackeries — of impostors and of impositions — is to be imputed chiefly to ignorance; but this is only one of several sources to which it should be referred. Credulity, a tendency, even in the incredulous, to believe in whatever is confidently asserted, a disposition to admire whatever is unknown or unexplainable, the faith which many place in the impossible — the Catholic dogma — "Credo quià impossibile est" — have collectively and severally an influence on the minds of the majority — on those who will not take the trouble of looking closely into matters, or of thinking sufficiently for themselves, especially when they are either imperfectly or not at all acquainted with the natures and relations of such matters. It is not a little remarkable that, since the founding of the College of Physicians at the commencement of the 16th century, expressly with the view of preventing the injurious and irregular medical practices of the day, down to recent times, most of the quacks and quackeries, against which the College had to contend, were patronised by Bishops and dignitaries of the Church, and by persons of high rank, as sufficiently set forth in Goodall's history of the College.

It would appear, at the present day, as if the aberrations of the human mind apparent in all classes and places, in matters connected with the disorders of the

171. *A. Superstitious practices* have been adopted for the cure of external scrofula since the earliest ages; and have been of various kinds, the oldest being more or less connected with pagan or religious rites, and the most recent with certain medical doctrines and quackeries which influence more or less the faith or confidence of the patient. It is not unlikely that scrofulous sores formed no small part of the external maladies, respecting which so ample a provision was made in the 13th, 14th, and 15th chapters of Leviticus, and for which the means were calculated no less to excite the faith and hopes of the patient, than to benefit the priests, who, in those ages and places of imperfect civilisation, conjoined the healing art with the priestly office. During the earlier epochs of Jewish history, both prophets and priests had recourse to sprinkling with oil and touching the diseased parts for the cure of external sores; and, before the introduction of Christianity into northern countries, the Druids or priests, whilst they undertook the treatment of these affections, most probably adopted the same or analogous means. Pliny, Tacitus, and Suetonius furnish some doubtful evidence of touching the sick having been resorted to, as one of the means of healing; and it would appear, from the Scandinavian Eddas and Sagas, and from some German and French writers in the seventeenth century, that the practice of healing external sores by the royal touch existed in the northern countries of Europe as early as the eleventh and twelfth centuries, and was very commonly adopted from those times until the middle of the eighteenth century.* When the age and other circumstances, in which external scrofula presents itself, are considered, it may be safely inferred, that a very large proportion of those who were thus touched recovered at indefinite periods after it was resorted to. The accession of puberty, the influence of the mind on the body, the change of living, of season, of air and scene, and the journey, when this mode of healing was confided in, and various related circumstances, combined to produce no mean constitutional effects, and thereby to remove the local manifestation of the constitutional evil. The transfer of nervine influence from the healthy to the sick, or any other mode of explanation which the modern mesmerist adopts to account for the effect, when effect was observed, could have but a small share, if any, in producing it; but, at the present day, mesmerism usurps the place of the royal touch, although with doubtful efficacy, unless it brings to its aid all the accessories which I have now mentioned, as well as many others aiding more or less in producing a constitutional as well as a local change.

172. *B. The preparations of Iodine* are amongst the most efficacious remedies which can be prescribed for scrofula, when judiciously administered and combined; but, when improperly employed they may be most injurious. I have employed them extensively both in public and private practice from 1820 until the present time; and have generally commenced their exhibition in small doses, and often much diluted, always preferring to give them very soon after a meal. The preparations of iodine I have preferred are, the iodide of potassium, the ioduretted solution of the iodide of potassium or the compound tincture of iodine, and the iodide of iron. The iodides of mercury are much more rarely indicated, and the iodide of sulphur is too irritating. The iodide of potassium I have often combined with the carbonate of potash, or with liquor potassæ, or with Brandish's alkaline solution, and sometimes also with preparations of cinchona, or of sarsaparilla, or with one or other of both. The iodide of iron should be given in syrup, especially the syrup of sarza. When scrofula is associated with syphilis, then the iodides of mercury may be given, or mercury may be prescribed night and morning, or otherwise employed, whilst the preparations of iodine are taken as just recommended.

173. During the exhibition of iodine in any form, especially if continued above a few days, the state and functions of the liver should be carefully watched; for iodine may, by passing directly into the portal circulation, excite, or even irritate, the liver to a very injurious extent. The preparations of iodine may be employed externally in various ways, either to the part affected, or by means of local or general baths. When applied to the diseased gland or part, care should be taken that they do not, by too great concentration, convert congestion into inflammatory action, or otherwise injuriously irritate the part. Baths containing the iodide of potassium, with or without the addition of sub-carbonate of potash, I have often found of much service, especially when brought in aid of internal means. Iodine, even when cautiously prescribed, may disagree with some constitutions. Its operation should therefore be carefully observed. It ought not to be too long employed, without intermitting its use; and, during its exhibition, the urine should be examined and tested, not merely with respect to its acidity or alkalinity, but also as to the presence of albumen; and if the latter appear, the use of the iodides should be relinquished.

174. *C. Mercurials.* — *Mercury*, in the form of *calomel*, *corrosive sublimate*, and *black sulphuret*

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body, were the humiliating inflictions of Providence on those to whom the professions are as a worldly craft, science as a matter of traffic, and learning as an occupation of the memory involving none of the higher manifestations of the mind. The history of human delusion, as to matters medical, and of the fashions which have successively engaged the weak and selfish, respecting the ailments of their debilitated frames, shows that, in an era of luxurious indulgence, of exhausting vices, and of enervating enjoyments, the impudent assertions of impostors have a more powerful influence on the minds and bodies thus emasculated, than the upright and rational advice of scientific and learned physicians. The victims of the former are either incapable of reasoning upon, or are too indolent to examine, the opinions and assertions which they practically adopt; and hence, of the several medical impostures of the present day, the most popular is that one which is the most extravagant in its pretensions, the most abounding in absurdity, and the most deficient in the least approach to truth. "*Probitas laudatur, et alget*" — honesty, however, is hardly praised; but dishonesty and assurance are more than praised — they are worshipped with a fervency equal to the extent of delusion they achieve — to the amount of their success — a success acquired only at the expense of human suffering, and by the sacrifice of human life, but worshipped nevertheless.

* During the seventeenth and eighteenth centuries, the seventh son of a seventh son, and still more the ninth son of a ninth son, divided the laurels with royalty for their success in curing scrofula by the touch; the odd numbers, as well as the rare occurrence of so prolific offsprings in succession, producing the cures as effectually as the high rank of the royal competitors. At the present day, the passes of the mesmerist profess to effect more than either the royal touch or the humbler ministrations of even the ninth son of a ninth son, wherever he may be found.

(Ethiop's mineral), was generally employed for scrofula during the 17th and 18th centuries. MAYERNE, BORDEU, MARX, and others, prescribed it not only internally, but also to the scrofulous sores. HUFELAND resorted to mercurials with the belief that they removed the scrofulous irritation by virtue of a law of the animal economy, that different kinds of irritation destroy each other, or, in other words, that one kind of irritation removes, by superseding, the antecedent irritation. But in this he assumes two things, namely, 1st, that the morbid action consists of irritation; and 2nd, that it or any irritation may be removed by an irritant, neither of which he nor any other one has proved. But, whilst HUFELAND and others recommended mercurials, even until they produced salivation in the more obstinate cases, others, with equal justice, contended, with MORTON and GIRTANNER, that they were injurious when carried so far as to occasion salivation; and they were fortified in this by the obvious impropriety of prescribing a debilitating medicine for a disease essentially of debility.

175. At the present day, several other preparations of mercury have been resorted to, especially *mercury* with *chalk*, the *iodide* and *sub-iodide*, the *bromide* and *sub-bromide*, and the *nitrate*, externally. I have employed several of these, especially the iodides, with results similar to those already mentioned in respect of iodine; but the mercurial iodides require a careful observation of their effects. Mercury with chalk is an excellent alterative, and is often required to correct or to increase the biliary functions. Of all the preparations of mercury, the *corrosive sublimate* is certainly the most beneficial; but it should be prescribed in very small doses, and generally in conjunction with some preparation of sarza or of cinchona; and when thus exhibited, I have found it almost equally efficacious with the preparations of iodine. It was much used by VAN SWIETEN, AKENSIDE, and their contemporaries. I have usually given it with the fluid compound extract, or syrup of sarsaparilla, or in the compound tincture or decoction of cinchona. In the more obstinate cases, a course of the sublimate may be alternated with a course of one of the iodides; and when the bones are at all implicated, this plan will generally prove efficacious, especially when aided by an appropriate diet and regimen.

176. *D. Preparations of Iron.*—Most of the preparations of iron may be given advantageously in scrofula, especially after morbid secretions and fæcal accumulations have been evacuated. The preparations which I have preferred are, the *ammonio-tartrate*, the *potassio-tartrate*, the *ammonio-chloride*, the *saccharine carbonate*, the *iodide*, and the *compound mixture of iron*. Mention has already been made of the iodide (§ 172.). The compound mixture of iron is one of the most efficacious, and I have usually prescribed it with an additional quantity of the carbonate of potash, or with solution of potash, with extract of conium and liquorice. The *sulphate* and *muriate of iron* were generally preferred by THILENIUS, THOMANN, and HUFELAND; and when the former can be taken in a pill, and when the latter is given in the form of the tincture of the sesquichloride, either of these is very beneficial. These preparations are most serviceable where there is any tendency to anæmia or chlorosis, and not less so when scrofula is associated with hysteria or disorder of the catamenia in any form.

177. *E. Chlorides.* — (*a.*) *Chloride of Barium.* — Dr. ADAIR CRAWFORD first contended for the anti-scrofulous operation of the muriate of baryta, and in this he was supported by FERRIAR, THOMANN, PEARSON, BUCHOLTZ, WESTRUMB, HUFELAND, PINEL, ARMSTRONG, WENDELSTADT, VERDIER, &c. But CHAPMAN, PORTAL, JADELOT, and others, have not fully confirmed the opinions which were formerly entertained respecting it. The muriate of baryta had fallen into neglect for some time, its use having been superseded by medicines which were found more efficacious and less irritating to the stomach, when Dr. PIRONDI advised a more active employment of it. He prescribed six grains of the medicine in four ounces of water, and directed a table-spoonful to be taken every hour, excepting the hours before and after a meal. He increased the dose by six grains every day, until a drachm was given; and the patient was restricted to a vegetable diet and water. Having had some acquaintance with Dr. PIRONDI, I was induced to make a partial trial of this plan in a few cases, but I could not succeed in giving more than ten or twelve grains in the twenty-four hours, and then it was given more diluted than he advises. Its irritating effects on the stomach frequently prevented me from prescribing more than six or seven grains in the twenty-four hours. It appeared to be more efficacious when given in moderate doses, either soon after or with the meals, than when taken in larger doses in the intervals. According to Dr. GLOVER, who makes a very favourable mention of the chloride of barium in scrofula, the *bromide* and *iodide* of *barium* has the same physiological action with the chloride, the iodide, moreover, acting energetically on the uterine system.

178. (*b.*) *Chloride of calcium* was formerly much employed against scrofulous swellings and sores, and in similar states of solution to those in which the chloride of barium was prescribed. BEDDOES, ODIER, FRANK, and HUFELAND have made favourable mention of this substance. The last-named of these writers, however, considered it more irritating than the chloride of barium, and that it, therefore, should be used more cautiously. Dr. SIMMONS stated it to be inefficacious, and Mr. PHILLIPS seems to be of a nearly similar opinion. "FOURCROY and the Dutch physicians had much confidence in its power over scrofula. BIETT for many years made much use of this medicine in the treatment of the scrofulous patients of St. Louis, without observing those inconveniences which are frequently attendant upon the use of baryta in full doses. It is the base of the anti-scrofulous nostrum of NIEMANN. I have frequently used it in the following form: — a drachm of this chloride to twenty drachms of distilled water, of which a tea-spoonful was taken in milk two or three times a-day. I have carried the dose up to two tea-spoonsful, but not exceeded that dose. I am not satisfied that it has any evident action upon scrofulous glands, but it is more generally tolerated than the chloride of barium." (PHILLIPS, op. cit., p. 282.)

179. (*c.*) There are other *chlorides*, as the *chloride of potassium*, the *chloride of zinc, &c.*, which, if judiciously employed, may act beneficially in scrofulous swellings and sores. The *chlorate of*

potass has been very frequently prescribed by me in this, and in other cachectic diseases since 1819, and I can recommend it as one of the substances most deserving adoption in scrofulous affections. Dr. Glover remarks that his experiments prove the *chloride of potassium* to be much more energetic than the corresponding compound of sodium, although not so powerful as the iodide of potassium. "There is scarcely a doubt but that the chlorides, bromides, and iodides of the same bases produce effects identically similar in kind, differing only in degree. The bromide of potassium is more powerful than the chloride, less active than the iodide. Not being so apt to occasion nausea as the latter substance, it may be used in cases where this might disagree."

180 *F.* Solutions of *chlorine—aqua chlorinei*—and chlorinated solutions of the alkalies have considerable influence in the more cachectic states of scrofula. Dr. Glover observes that the strongest analogy, in physiological and medicinal properties, exists between chlorine, bromine, and iodine; and that any one of these bodies is capable of producing the effects which can be obtained from another; but that the different forms in which we must use them give rise to differences in action. "Thus the very slight solubility of iodine almost precludes its use in watery solution; and the convenience with which solutions of *bromine* can be prepared renders this body peculiarly adapted to form lotions for external application." Mr. Potter and Dr. Glover have proved the utility of bromine used externally; eight or twelve minims of bromine being added to a pint or half a pint of water. I have directed one drachm of bromine to eight ounces of distilled water; and from five to twelve drops of this solution to be taken in any suitable vehicle internally; and from one to two drachms of the solution to eight ounces of water for external use.

181. *G. Alkalies* have long had a great reputation for the cure of tuberculosis and scrofula. They are much praised by Hamilton, Blankard, Kirkland and Fodéré, especially the carbonates, and the solution of potass. These are, however, much less efficacious than Brandish's alkaline solution, which owes much of its efficacy to the lime which it contains. The alkalies should generally be conjoined with tonic or bitter infusions, or decoctions, with chalybeates, as in the mistura ferri composita, or with deobstruent extracts, as taraxacum, guaiacum, sarza, &c.; or they may be given in the form of common or medicated soap, in conjunction with these extracts, or with ammoniacum, myrrh, &c. I have frequently combined either of the carbonates, or the solution of potash, with the iodide of potassium with marked advantage. The aërated alkaline waters may be made the vehicle for several other medicines in the form of tincture; and, when the bowels are lax or irritable, or discharges from any of the mucous canals are troublesome, then lime water, or the aërated lime water taken either alone, or with milk, or with other medicines, which the circumstances of the case will indicate, will be of great service.

182. *H. Acids* have rarely been found of service in scrofulous swellings, although they have often been given in certain states of tuberculosis, especially when affecting the lungs, and sometimes with benefit. I have found, however, the *nitro-hydrochloric acids*, used internally or externally, or in both ways, of great service; and they may be employed either as the chief means, or in aid of other remedies. They are most beneficial when the functions of the liver are imperfectly performed, when the circulation is languid and weak, especially in the extremities, and when the hands or feet are cold. The *hydrochloric* acid was recommended by Ferriar and Joerdens, and I have prescribed it in scrofulous affections in the decoction or infusion of cinchona with much advantage. The nitro-hydrochloric acids may be taken either alone or in bitter or tonic infusions.

183. *I. Tonics* of various kinds have been very generally recommended for external scrofulous affections, but not so frequently for internal tuberculosis as rational views of the nature of this malady might have suggested. The preparations of *cinchona* were much employed by Whytt, Fothergill, Northcote, and Fordyce; and various bitter extracts and vegetable tonics by Grosmann, Hufeland and others. The connection of scrofulous affections with debility, and with imperfect digestion and assimilation, indicates the necessity of having recourse to this class of medicines either as the principal means of cure, or as adjuvants, or as the vehicles, of other more specific remedies. A solution of *pepsin* has been recommended as a tonic and promoter of digestion by Dr. Tyler Smith. He gives it a quarter of an hour after every solid meal, and in larger quantity after dinner than at any other time.

184. *K. Cod-liver oil* and the *oil* from the livers of *other species* of the same genus have been recently much employed in the treatment of all forms of scrofula and tuberculosis. I have prescribed it since its use was revived; and I have had numerous occasions of observing its beneficial effects, especially when aided by such means as the peculiarities of the case should suggest. Its operation is not merely that of a nutrient, but it is also alterative, and it certainly produces more or less of a healing influence on ulcerated cavities or surfaces; these effects being the more manifest, the more recent the oil, and the less it is subjected to clarification and other chemical manipulations. I have usually found it most beneficial when taken on the surface of diluted lemon-juice, or on lemonade, or on the surface of the infusion of orange-peel, with or without a few drops of the solution of potash, or of Brandish's solution; or on water containing a few drops of the nitro-hydrochloric acids, or of the muriated tincture of iron. When there is much cachexia, or inaction of the liver, or more or less anæmia, these modes of exhibition should be preferred.

185. *L. Burnt Sponge* had once considerable reputation for the cure of scrofula, and to this it was chiefly indebted to Arnault de Villeneuve, Astruc, Lane, Ring, Fodéré, and Hufeland. I have had no experience of its effects; but that it was entirely without effect I cannot believe, although the quantity of iodine it contains is very minute. The animal charcoal which was thus formed might not have been entirely inefficacious, especially in correcting the contents of the alimentary canal; for which, indeed, powdered *charcoal* is extremely efficacious. Lettsom, a sagacious practitioner, often had recourse to burnt sponge, and sometimes gave it with calomel.

186. *M. Various substances* have been employed

more or less *empirically*, or without any clear ideas as to their operation, or as to the amount of effect which may be ascribed to them.—(*a.*) Of the benefit which may be derived from *emetics* and *stomachic aperients*, as advised by Schmidt, Weikard, and others, there can be no doubt, when prescribed at the commencement of the treatment, and when circumstances indicating their use are present. Several other substances were also much employed at different periods, and were probably not altogether without benefit, particularly as alteratives and restoratives, thereby improving the constitutional powers. Amongst these *guaiacum*, *sassafras*, the decoction of *walnut-leaves*, *willow-bark*, *hops*, *taraxacum*, *tussilago*, *cantharides*, *assafœtida*, *&c.*, held the most conspicuous places. Riverius prescribed *gum ammoniacum*, both internally and externally; and I have seen much benefit derived from the *balsam of Peru*; and, in other instances, from *capsicum* taken internally, and from the external application of a weak infusion of it to scrofulous sores. Dr. Tyler Smith has recently recommended the exhibition of *pepsin* in order to promote the functions of the stomach.

187. (*b.*) *Digitalis* was formerly much employed internally against scrofulous and tubercular diseases. M. Bayle (*Biblioth. Thérapeutique*, t. iii.) states that it was first prescribed by Van Helmont; and subsequently by Haller and Darwin, the latter of whom gave the powder in as large doses as five or six grains thrice daily. This substance was used also externally, either in the form of the infusion, or powder of the leaves, and the internal and external uses were conjoined. I have no experience of the remedy in scrofula, and I believe that is more likely to prove injurious than beneficial. The *walnut-leaves* have lately been much recommended by M. Negrier; but I agree with Dr. Glover in considering them as only slightly beneficial, as a tonic, when the preparations of these leaves are used internally, and as an astringent when applied externally, and as inferior to several other tonics and alteratives usually adopted.

188. (*c.*) At the commencement of the last century *tar-water* was very much vaunted for the cure of every form of scrofula and tuberculosis, and some years ago I prescribed it largely both internally, and externally in a stronger form, as a wash to scrofulous sores; and from my experience of its effects I consider it one of the most efficacious means which we possess, when aided by a suitable diet and regimen. I also gave the pure Norwegian *tar* in the form of pill by means of liquorice powder. Tar may be given more largely when made into pills with magnesia, but in this combination the pills often pass through the bowels without being dissolved. In the more indolent states of scrofulous sores, *creosote* may be substituted for tar-water, but my experience leads me to prefer the latter. The tar may likewise be made into pills with powdered charcoal or other substances, or be taken in gelatine capsules. This medicine is often very efficacious in the chronic cutaneous eruptions which occur in the scrofulous taint or associated with any of the forms of scrofula or tuberculosis.

189. (*d.*) During the 16th and 17th centuries, and more recently, a medicine was much in vogue as an alterative and restorative, not only in scrofula, but also in many other maladies, under the appellation of the *infusion of a thousand flowers*. This consisted of an infusion, either warm or cold, of the recent dung of cows and bullocks feeding in open pastures. The only effect which this medicine could produce must be referred to the proportion of bile which it contained. That *ox-gall* is possessed of much efficacy, either alone, or properly combined, I have shown in various parts of this work, especially in promoting the digestive and assimilating processes. It is readily procured in the states of inspissation and extract. I have prescribed it in the form of pill since 1820, and it is now kept by most of the chemists in this city. It is most beneficially used as an adjunct to other appropriate means, especially in states of inaction of the liver, and when the bowels are weak and irritable.

190. (*e.*) Since the work of Stoerck on *Conium* appeared, this substance has had great reputation for the cure of scrofula; and, although it has received the commendations of Quarin, Rutty, and many others, I am at a loss to recognise its virtues. The same remark applies to *digitalis*, which has been prescribed by Menz, Darwin, and Hufeland. *Sulphur* in various states of combination is more deserving attention. I have often prescribed it in scrofulous affections, in conjunction with magnesia, powdered cascarilla, or aromatics and warm carminatives, with the view of promoting the cutaneous functions, which are often imperfectly performed, (and this object it attains more permanently than most other means,) and in order to promote the intestinal evacuations. *Camphor* was recommended internally by Copland, Lettsom, and Fodéré, and externally dissolved in olive oil; and in this form it may be applied with gentle friction or more permanently. *Sulphate of zinc* was praised by White, but it is much inferior to the sulphate, or other preparations of iron.

191. (*f.*) *Electricity* was long since recommended by Sigaud la Fond for scrofulous swellings, and its use has been recently revived; but in whatever manner this agent may be employed, either as electro-galvanism, or as electro-magnetism, or as shocks from the Leyden jar, or as sparks from the parts affected, it is appropriate only to the more indolent and atonic states, and when the parts furnish no signs of acute inflammatory action.

192. N. *Change of air* to the sea-side, in connection with sea-bathing, &c., has frequently a beneficial influence, and a considerable share of the benefit has been imputed to the sea-air. The amount of benefit has most probably been exaggerated, but I cannot think that it is without influence, especially when the body is duly protected from cold. Mr. Phillips thinks that change to the sea-coast exercises no greater influence on scrofula than change to any inland situation where the air is pure and dry. For young persons and scrofulous children change of air is always beneficial, and when this can be conjoined with the use of sea-water and sea-bathing, I believe the benefit to be augmented; and, for this purpose, especially to residents in the metropolis or other large towns, there are no places more salubrious, during the months of June, July, August, and September, than Lowestoft and its vicinity, and the Isle of Thanet.

193. (*a.*) *Sea and mineral waters* have always had a great reputation in the treatment of scrofulous and tubercular affections. Sea-water has been strongly recommended by Russell, Kirkland, Tolberg, and many others, both internally and externally; and of all waters it is certainly most generally appropriate and efficacious, if its use be judiciously directed. When it can be retained on the stomach, even in small quantity, it will generally be taken internally with benefit; and when the bowels are sluggish it is one of the best aperients that can be given. As a warm, tepid, shower, or cold bath, or used in washing or sponging the surface, it is also an excellent remedy. But when sea-bathing is adopted, especially for children, the period of immersion should be brief—short in proportion to their youth and the amount of debility; and, if alarm be caused by it, the shock should be avoided by substituting effusion on the surface by a sponge, or even by less alarming modes of employing salt-water. In some cases artificial sea-water may be used, or a solution of bay-salt, or this salt may be added to sea-water. Reaction should follow cold bathing, and when this is not manifested, either the period of immersion has been too protracted, or the means is too severe for the constitutional powers of the patient, and should not be persisted in.

194. (*b.*) *Several mineral waters* are used with great benefit, both internally and externally, for scrofulous affections; but they should be prescribed with strict reference to the states of nutrition, circulation, and assimilation, otherwise but little advantage will be derived from them. Where the assimilative functions are much impaired, and more or less of anæmia exists, the chalybeate mineral waters of this country should be preferred; and these may not only be taken internally, but also used externally as baths, as advised by Lentin and others. The several alkaline and sulphureous waters, as those of Bath, Harrowgate, Leamington, &c., are generally of service, especially when a deobstruent and alterative effect is required. Dr. Glover remarks that the mineral waters of Shap and Shotley, in the north of England, appear to be the best suited for scrofula, on account of the large quantity of alkaline and earthy muriates which they contain. Besides these, the mineral springs and the factitious waters of Carlsbad, Ems, Fachingen, Homberg, Kissingen, Seltzer, and of Barèges, Bonnes, Cauterets, Enghien, &c., have severally been recommended in scrofulous affections, and are more or less beneficial when judiciously employed, and aided by suitable medicines, diet, and regimen.

195. *O. Medicated baths* of various kinds have been recommended for external scrofula. Those containing the iodide of iron, or iodide of potassium with the sub-carbonate of potass, or small quantities of the sulphuret of potash, are the most beneficial. I have prescribed baths with the sub-carbonate of potash alone, and believed them to have been of service. It is manifest that these can be viewed merely as aids of internal remedies.

196. *P. The local treatment of scrofula* requires merely a few remarks; for if scrofulous glandular swellings receive an early attention, the internal or constitutional means described above, more especially the administration of the preparations and combinations of iodine, appropriately to the circumstances of the case, should be chiefly confided in. The treatment of scrofulous swellings should depend chiefly on the absence or presence of increased heat and redness. If either or both be present, very different means from those which are indicated when they are absent, are required. As long as the tumour continues devoid of redness, of increased heat, or much tenderness, gentle frictions with fresh olive-oil, to which small proportions of spirits of turpentine and camphor are added, with or without a little soap, will generally be of service. The preparations of iodine, especially ointments, lotions, and tinctures of iodine, have been much employed to the affected parts. But these should be sufficiently mild not to irritate the skin; for when they are too strong, the irritation of the surface caused by them will extend to the parts underneath, and superinduce an inflammation which might not otherwise have occurred. The iodine ointment of the Pharmacopœia is much too strong, and contains too large a proportion of iodine as respects that of the iodide of potassium and that of lard. I have much preferred the ointments prescribed in the Appendix (see *Form.* 766—770.); and even they should be cautiously applied, so as to avoid irritation and pain. If the swelling be painful, or if it be irritated by the friction, the compound tincture of iodine may be applied, more or less diluted, to the surface, or the lotions prescribed in the Appendix may be employed (see *Form.* 671—673.), but the stronger of these should be very much diluted.

197. When inflammatory action appears, either in the surface of the swelling or in the subjacent parts, the more common applications for sthenic inflammation are seldom of service, but, on the contrary, are often prejudicial. The existence o pain in the swollen part should not be viewed as always indicative of inflammation, for where the former is most severe, the latter may not be present. In these cases, the *unguentum iodinii plumbi*, and the *unguentum iodinii opiatum*, in the Appendix (*Form.* 768. 770.), are the most serviceable. I have also found the *unguent. calomelanos cum camphorâ* (*Form.* 757.) of use. These ointments should be rubbed gently over the surface, without exciting irritation. If increased heat and redness continue nevertheless, warm and anodyne applications are frequently more beneficial. In these cases, either of the deobstruent ointments in the Appendix (*Form.* 761, 762.) may be tried, as there prescribed or more or less diluted.

198. If the inflamed part goes on to *suppuration*, an early outlet should be given to the matter, as its retention contaminates the tissues which surround it, and, extending in more than one direction, often gives rise to sinuses. The *ulceration* consequent on scrofulous suppuration generally requires not only much attention to the general health, by the means above described, but also a pure air, and suitable diet and regimen. In addition to these, gently stimulating applications, consisting either of very weak ioduretted ointments or lotions, — of ointments containing either the balsam of Peru or a small proportion of the iodide of zinc, — of lotions containing a few drops of the tincture of capsicum, or of one of the chlorides, — will be used with benefit. The solutions of iodine recommended by Lugol to scrofulous ulcers are the following: —

	No. 1.	No. 2.	No. 3.
Iodine	2 grs.	3 grs.	4 grs.
Iodide of Potass.	4 grs.	6 grs.	8 grs.
Distilled water	1 pound	1 pound	1 pound

These, commencing with the weakest, may be used frequently, either as washes or lotions, or be injected into scrofulous sinuses.

199. *Q. The diet and regimen* of scrofulous and tubercular subjects, whether *infants*, *children*, or *adults*, are in every respect the same as above recommended (§§ 148—153.) for the *prevention and the hygeienic treatment of scrofula and tuberculosis.* The chief of these means are animal warmth and suitable food during infancy; a pure, dry, moderately warm and uncontaminated atmosphere; due ventilation of the apartments, especially of bedrooms; change of air, sea-air, and voyaging; a due regulation and subjugation of the passions, desires and imagination; a light, digestible, and nutritious diet, avoiding stimulants or heating beverages; and regular exercise in the open air; due exposure to light and sunshine; early and regular hours for sleeping and waking, and for meals; and attention to the states of all the secretions and excretions, — the cutaneous, intestinal, and urinary,—are the most conducive, not merely to the prevention of scrofula and tuberculosis, but also to the recovery of health in all the forms in which these states of disease manifest themselves.

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SCURVY. — Synon.: *Scorbutus*, Sauvages, Vogel, Cullen, &c.: *Scorbutus Nauticus*, Young; — *Porphyra Nautica*, Good; — *Scharbock, Skorbut*, Germ.; *Skiorbug*, Dan.; — *Scorbut*, Fr.; — *Scorbuto*, Ital.; — *Scorb, Scarbock, Skörbut, Scorbie*, &c., Saxon, — hence *Scorbutus, Scurvy*.

Classif. — 4*th Class.* Cachectic Diseases; — 3*rd Order.* Impetiginous affections (Cullen); — 3*rd Class.* Sanguineous Diseases; — 4*th Order.* Cachexies (*Good*). Class. IV. Order IV. (*Author in Preface*).

1. Defin. — *Lassitude, Debility, lowness of spirits, fœtor of the breath and sponginess of the gums, followed by livid sub-cutaneous patches and spots, especially on the lower extremities and roots of the hair, and lastly, by spontaneous hæmorrhages from mucous canals, by contractions and pains of the limbs, and superficial ulcers, &c., the disease proceeding from an alteration of the blood, caused by the nature of the food, and chiefly by the privation of fresh vegetables and fruit.*

2. I. Historical Sketch.—Some writers have supposed, with Sennertus, Mead, and Milman, that scurvy was known to the ancients, whilst others have believed, with Friend, that there is nothing to be found in their writings to warrant this supposition. Hippocrates, in mentioning enlargement of the spleen — *σπλὴν μέγας* — notices but one symptom which is applicable to scurvy, and that is ulceration of the legs; and, in describing Convolvulus Sanguineus — Εἰλεὸς *αἱματίτης*—he adduces the dark discolouration of the skin, the eruption of ulcers on the legs, and the difficulty of walking, as more particularly distinguishing it. But these remarks are insufficient to show that he was actually acquainted with true scurvy. It has been supposed, that the disease, with which Pliny states the army of Cæsar Germanicus to have been afflicted after a long encampment in Germany beyond the Rhine, near the sea-coast, and which was ascribed to the water which was drank, was that now under consideration. He states, that "the teeth dropped out, and the knees became paralytic. The physicians called the malady *Stomacace* and *Sceletyrbe*. They discovered a remedy against it, viz. *Herba Britannica*." What this plant, of which Pliny adds a very short and imperfect description, actually was has not been shown by his commentators. Subsequent ancient writers, not even the Arabians, have furnished nothing in addition to what I have now adduced.

3. The earliest account of scurvy is that given by the Sieur Joinville, as it appeared in 1260, in the army of Louis IX. in Egypt, owing to the nature and scarcity of the food, and the scarcity of water. The next notice taken of it is by Fabricius, who states that it was very prevalent and fatal in Misnia, during 1486. As soon as long voyages were undertaken, scurvy appeared in an unmistakeable form. During the voyage of Vasco de Gama, who first made the passage to the East Indies, by the Cape of Good Hope, more than 100 of his men out of 160 died of this malady. The History of Portuguese discoveries, by W. Lopes de Castennada contains the relation of this voyage, which furnished the first account of this disease as it occurred at sea.

4. That scurvy was not then, nor for some time afterwards known, is evident from the account given by Cartier of his second voyage to Newfoundland in 1535. After mentioning the characteristic symptoms he adds that, "about the middle of February, of a hundred and ten people there were not ten whole." "Eight were already dead, and more than fifty sick, seemingly past all hopes of recovery. This malady being unknown to us, the body of one of our men was opened, to see if by any means possible the occasion of it might be discovered, and the rest of us preserved. But in such sort did the calamity increase, that there were not now above three sound men left. Twenty-five of our best men died; and all the rest were so ill, that we thought they would never recover again. When it pleased God to send us the knowledge of a remedy for our health and recovery." The remedy was a decoction of the leaves and bark of a tree, which was called by the natives *ameda* or *hamuda*, and which has been considered to have been a species of spruce-fir.

5. Dr. Lind states, that the name of this disease

is said to be mentioned in the history of Saxony, by **Albert Kruntz**; and if so, he will be found the first author now extant who calls it the scurvy. It is next taken notice of by **Euritius Cordus** in his *Botanologicon*, published in 1534, where it is observed that the herb chelidonium minus is called by the Saxons *Schorbock rout*, being an excellent remedy for that disease. In the year 1539 it is mentioned by J. **Agricola** in his *Medicina Herbaria* **Olaus Magnus**, in his history of the northern nations, published in 1555, observing what diseases are peculiar to them, gives a long description of scurvy, mentioning that it is vulgarly called *Schoerbuck*, which is synonimous with the cachexia of the Greeks. He refers it chiefly to the nature of the food, and mentions, that the habitual use of absinthiated beverages is had recourse to in order to prevent and to cure it. About this period four treatises on the disease were published by **Ronsseus**, **Ecthius**, **Wierus**, and **Langius**. **Forestus** states, that the description by **Ecthius** was contained in an epistle sent in 1541 to **Blienburchius**, a physician in Utrecht. The first book published expressly on scurvy was by **Ronsseus**, who remarks, in a reprint, that if he had first seen the accurate description by **Wierus**, his own should not have been published.

6. **Wierus** states, that scurvy had been long peculiar to the inhabitants of the countries near the North seas, and that he had never met with it in Spain, France, or Italy, nor in Asia or Africa. There can be no doubt of the existence of scurvy in the northern countries of Europe from the earliest ages, although no account of it had appeared previously to the appearance of the works now mentioned; and it is equally manifest that years of scarcity, wars, sieges, &c., must have rendered it more or less endemic, or even epidemic, in various places and localities. During severe winters and early spring, the food of the inhabitants of these countries, the dried and imperfectly-cured meats and fish, and the want of succulent and other vegetables, particularly in the countries adjoining the Baltic, and the Northern and German Oceans, must have occasioned a remarkable prevalence of this malady, even although nature had provided them with the best preventives and means of cure, in the spruce-fir and numerous other anti-scorbutic plants and herbs, with which they abound. The comparatively recent culture of succulent vegetables, an dmore especially of the potato, in these countries, accounts not only for the rarer appearance of this malady in these parts in recent times, but also for the prevalence of it during earlier ages.

7. Of the four ships which sailed from England the beginning of April, 1609, for the establishment of the East India Company, three were so severely visited by scurvy as to have lost nearly one-fourth of their crews when they arrived at the Cape of Good Hope. The commodore's ship was not attacked. This immunity arose from three table-spoonfuls of lemon-juice having been served daily to each of his men. Notwithstanding this evidence of the success of lemon-juice in preventing scurvy,—evidence the most conclusive,—this valuable remedy and preventive was altogether slighted for 150 years afterwards, although scurvy destroyed often one-half or three-fourths of the crews of our fleets, and was more destructive to our armies than either battles or sieges, independently of the deaths it occasioned, both on land and at sea, in trading vessels. Sir R. **Hawkins** states, in his observations on his voyage to the South Sea in 1593, that upwards of ten thousand mariners had died of scurvy under his own observation alone, during the twenty years that he had been at sea. (**Purchas**'s *Collect. of Voyages*, vol. i. & iv.) Admiral **Hosier**, who sailed in April, 1728, with seven ships of the line to the West Indies, buried his crews twice, and died broken-hearted in consequence. Lord **Anson**'s expedition, at the end of two years from its leaving England in 1740, had lost from this disease more than four-fifths of the number that sailed in it. The voyages of **Drake**, **Cavendish**, **Dampier**, **Byron**, and of numerous other navigators, furnish similar details, and show how recklessly the lives of sailors were sacrificed.

8. But it was not only in fleets and single ships that scurvy was so destructive, but also in towns, fortifications, camps, and armies, and wherever the population was subjected to the causes which occasioned it in fleets. That scurvy was endemic, and also epidemic, in northern European countries, has been stated to be manifest from the early works on the disease, and from the nature of the food upon which their inhabitants subsisted. Owing to the difficulty of procuring fresh, succulent vegetables, and from their ignorance of the disease and of its several preventives and cures, the early frequenters of Hudson's Bay, of Newfoundland, and the coast of Labrador, were frequently almost altogether destroyed; and the early French settlers in Canada experienced so severe losses in winter and early spring from this disease, as almost to induce them to abandon the settlement.

9. Whilst sporadic cases of scurvy were of frequent occurrence, the ravages of the disease were often great in winter and spring, especially in years of scarcity, and in besieged towns or fortifications, and in armies. **Vander Mye** states that, during the siege of Breda by the Spaniards in 1625, the garrison and inhabitants were grievously afflicted with this disease, 1608 soldiers having been attacked up to the fourth month of the siege, the numbers having increased daily until the place surrendered in June, after a siege of eight months. **Backstrom** has recorded that, in 1703, when Thorn in Prussia was besieged by the Swedes, 5000 of the garrison, besides many of the inhabitants, were carried off by scurvy during the five months' siege; the besiegers being altogether exempt from it. During the war between the Austrians and Turks in 1720, "when the Imperial army wintered in Hungary, many thousands of the common soldiers, but not one officer, were cut off by scurvy. Dr. **Kramer**, physician to the army, being unacquainted with a remedy for it, requested a consultation of the College of Physicians at Vienna. Their advice was, however, of no avail; the disease, which broke out at the end of winter, continued until, at the approach of summer, the earth became covered with greens and vegetables." **Backstrom** (*Observat. circa Scorbutum*, &c., 1734) states, that both in the siege of Thorn and in the Imperial army, as soon as the former was raised, and vegetables and greens from the country were admitted into the town, and when the latter procured the same articles of food, the disease entirely disappeared. From these and other facts he concludes, that an

abstinence from recent vegetables is altogether and solely the cause of the distemper, and so these alone are its effectual remedies.

10. Dr. Nitzsch in 1747 gave a detailed account of the prevalence of scurvy in the Russian armies, especially at Wiburgh, and during the siege of Asoph, in 1736. At these and other places, the mortality was great during winter and spring, and was, as on most other occasions, ascribed to the unwholesome nature of the food, and the want of fresh succulent vegetables. In the spring of 1760, the British troops, forming the garrison of Quebec after its capture from the French, suffered so severely from cold, and the want of vegetables, that before the end of April, 1000 of them were dead of scurvy, and more than twice that number unfit for service. M. Fodéré states that scurvy was remarkably prevalent in the French army of the Alps in 1795; and Larrey says that, in 1801, during the siege of Alexandria, which was commenced in May and ended with August, 3500 scorbutic patients were received into the military hospitals of the city. During the war in Siam and Ava the Native and British troops suffered most severely from scurvy and scorbutic dysentery *, owing to causes which will be referred to in the sequel. In 1836, the troops in the province of Adelaide, near the Cape of Good Hope, also suffered severely from scurvy, although abundantly supplied with good fresh meat; but they had been long without fresh vegetables and fruit. Scurvy was seldom or never seen in Great Britain since the end of the last century, up to 1847, excepting in gaols and penitentiaries. In 1823 it appeared in the form of scorbutic dysentery in the Millbank penitentiary, owing to a poor and watery diet, without fresh or succulent vegetables; and, in 1836, 37, and 38, it occurred in several gaols, owing to the same causes, more especially to the privation of fresh succulent vegetables. During the early months of 1847, 48, and 49, scurvy has appeared in various parts of England, Scotland, and Ireland, owing chiefly to the potato-blight. The *Literary History* of this disease will more fully appear from the Bibliography and References appended to this article.

11. II. Description.— i. Of the *symptoms of scurvy*, the earliest are observed in the countenance. The face, as well as the rest of the surface, is pale and bloated. The carunculæ of the eyes and lips have a dirty or greenish hue. The expression of the features is depressed. The gums are swollen, spongy, soft, livid, and bleed on the slightest friction. The odour of the breath is offensive. The patient complains of lassitude and debility, frequently of pains in the lower extremities, resembling rheumatism. He is averse from any kind of exertion; and when he attempts to exert himself he complains of stiffness of the joints, feebleness of the limbs, of panting or breathlessness, and of extreme fatigue. The skin is dry and harsh, and it generally continues dry throughout the course of the malady. Sometimes it is rough, resembling the goose-skin appearance; but it is more frequently shining with patches, streaks or spots of a reddish brown, bluish, greenish, black or livid hue, resembling those following a severe bruise. The size of these patches varies from a small point to that of a hand breadth, and it generally increases with the progress of the malady. The patches are first observed, and are most numerous, on the legs and thighs; but they soon appear on the arms and trunk, and on the scalp; very rarely on the face, which, however, assumes a more dingy and bloated hue. The ankles swell and the legs and feet become œdematous. In addition to these, the patient often complains of shifting pains; and, if the disease have supervened upon rheumatism or ague, these pains are more or less severe, and are referred to the bones, to the back, thorax, or joints. When the disease follows ague, obscure or irregular remissions or intermissions of febrile symptoms are observable, and more or less enlargement, with pain in the region of the spleen, is often detected. The above may be considered as the *first or early stage* of the distemper.

12. These symptoms may continue a longer or shorter time, or may be removed quickly by an appropriate treatment; but otherwise they may remain stationary; or, if the cause continues, they increase in severity. The gums become more tumid, more livid, and bleed from the slightest touch, and the breath remarkably offensive; the patches on the surface of the body enlarge, increase in number, and present a deeper and darker ecchymosed appearance. The pains are more severe, and are accompanied with swellings of the hams, stiffness and contractions of the knee-joints and ankles, and often with a brawny-feel of the parts owing to effusion of lymph between the integuments and aponeuroses, preventing the motion of the skin over the swollen parts. With the exudation of lymph, red globules, &c. into the tissues, chiefly into the connecting cellular tissue, and periosteum, exudations of blood take place, giving rise to more or less marked *hæmorrhage* from mucous canals, especially from the nostrils, mouth, and bowels, and from the vagina; much more rarely from the bronchi, urinary organs, and stomach. The tendency to hæmorrhage increases with the progress of the malady, and the loss of blood is often so great as to rapidly sink the vital powers of the patient. In *this advanced stage*, the livid patches are generally associated with hard and painful swellings in various parts, particularly in the lower extremities, and in the calves of the legs; and these often pass into superficial fungous ulcers. Old cicatrices frequently open afresh, and become the seats of foul scorbutic sores. The teeth fall out; the gums present foul, livid, spongy ulcers. The respiration becomes remarkably short and hurried on the least exertion, and deliquium or faintness is apt to supervene. The contractions of the joints, the œdema, induration, and pain of swollen parts, the discolouration of the patches, and the number of the ulcers, are all more and more developed; and the debility and vital depression greater.

13. From the commencement of the disease the *alvine evacuations* are more or less disordered. The stools are morbid; but, at first, they are not so remarkably so as to attract attention, and costiveness is then often experienced; but, as the disease

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* During 1827, the Directors of the East India Company allowed me to inspect the Regimental and other returns preserved in the India House, respecting the Causes, Nature, and Treatment of this disease as it occurred in the expedition to Ava, and of the Cholera then prevalent in India.

advances, they are not only much disordered, but are much more frequent and very offensive. Diarrhœa and colicky pains often supervene; and, with more or less attendant hæmorrhage, rapidly sink the patient at this stage. Under certain circumstances, the disease passes into a state of scorbutic dysentery, or dysentery and scorbutus supervene upon each other, and thus become associated, as shown when treating of Dysentery (*see that art.* § 39. *et seq.*). The *urine* is scanty and high-coloured (see § 20.).

14. The *pulse* is often little affected at an early stage; but is more generally slower and feebler than in health; but, in more advanced cases, or when the malady is associated with some degree of asthenic or sub-inflammation in the seats of effusion, the pulse is often remarkably frequent as well as small or weak. When the pulse is slow and feeble, the patient is often chilly, the surface cool, and the temperature of the body lower than natural. This state of the disease was called the *cold scurvy* by the earlier writers. When much swelling and hardness, with pain, is occasioned by effusion in the connecting cellular tissue, or even below the periosteum, the pulse is generally frequent, varying from 100 to 120 in a minute, probably owing to some degree of inflammatory irritation produced by the effused matters in these situations, as indicated by the great tenderness which always is present. This state of febrile action gave rise to the distinction of *hot scurvy* according to various authors.

15. The *tongue* is generally clean and pale, but commonly broad, flabby, and indented at its edges by the teeth. The insides of the cheeks and lips are pallid, and contrast remarkably with the appearance of the gums. *Thirst* is not much complained of, unless in the more febrile state of the disease, or when the supply of fluids is scanty. The *appetite* is not impaired. It may be even greater than in health; and digestion is not very manifestly impaired. *Sleep* is not deficient, unless at a far advanced stage, when wakefulness or disturbed sleep is experienced. The *mental faculties* are not impaired, although the spirits are generally more or less dejected, and anxious; but towards a fatal issue the patient becomes indifferent and torpid. The memory is generally unimpaired; but the eye-sight is occasionally weakened.

16. As the disease approaches an unfavourable issue the *breathing* becomes remarkably frequent, and the *dyspnœa* extreme. The patient coughs, and expectorates a frothy mucus, sometimes tinged with dark blood. The chest was generally every where resonant on percussion; the respiratory murmur was loud and distinct; and the sounds of the heart were loud and extensive, but unaccompanied by any morbid bruit in six cases examined by Dr. Budd. In the most advanced states of scurvy not only may ulcers and injuries or wounds which have healed up for many years break out afresh, but old and well-united fractures may become disunited. The tendency to *swoon* in the most severe cases is sometimes so great that the slightest motion, or the erect posture, or even any trifling exertion, may be followed by fatal syncope. It is stated in the account of Lord Anson's voyage, that many of the men, although confined to their hammocks, ate and drank heartily, were cheerful, and talked with much seeming vigour, and in a strong tone of voice; and yet, on their being the least moved, although it was only from one part of the ship to another, and that in their hammocks, they have immediately expired; and others who have confided in their seeming strength, and have resolved to get out of their hammocks, have died before they could reach the deck. And it was no uncommon thing for those who could do some kind of duty, and walk the deck, to drop down dead in an instant, on any endeavours to act with their utmost vigour.

17. Emaciation is not necessarily a phenomenon of the disease, unless there has actually been considerable privation of food; but it is occasionally observed, and anæmia is not infrequent. Dr. Budd observes that, although there is a remarkable tendency to the breaking out of old ulcers or wounds long previously healed, yet there is very little disposition to the occurrence of bed-sores from pressure. The separation of the epiphyses from bones has been mentioned by some writers, as having occurred in children attacked by this malady, but it has not been often observed in adults, or, if observed, not mentioned by many writers.

18. *Scorbutic ulcers* exude a thin, fœtid, sanious fluid, instead of pus. Their edges are of a livid colour, and as if puffed up; a coagulum soon forms on their surfaces, which is separated or wiped away with difficulty. The parts underneath it are soft, spongy, or putrid. When this coagulum is removed, the same change again occurs after a few hours, forming a soft, bloody, fungus, resembling boiled bullock's liver. This fungus exudation, Dr. Lind states, sometimes rises in a night's time to a great size, and, although cut off, in which case a plentiful hæmorrhage generally ensues, at the next dressing is as large as ever.

19. ii. The Chemical Analyses of the Blood and Urine in scurvy have been few, and even these unsatisfactory. It is manifest that the states of the blood and of the excretions in this disease will depend much upon the treatment adopted, and upon the time during which the treatment has preceded the analysis.—*A.* Simon's "Animal Chemistry" furnishes no information as to the *blood* in scurvy; but Dr. Day, in his additions to the work, states that Mr. Busk, in three well-marked cases of scurvy, found the composition of the blood as follows; comparing the scorbutic blood with the healthy according to his analysis of the latter: —

	1st Case.	2nd Case.	3rd Case.	4th. Heal. blood. (*Busk*).
Water - - -	849·9	835·9	846·2	788 8
Solid constituents -	150·1	164·1	153·8	211·2
Fibrin - - -	6·5	4·5	5 9	3·3
Albumen - -	84·0	76·6	74·2	67·2
Blood-corpuscles -	47·8	72·3	60·7	133·7
Salts - - -	9·5	11·5	10·9	6·8

Although the fibrin appears to be increased, its vital cohesion is evidently impaired; and the albumen is certainly altered in quality, although the alteration is not shown by chemical analysis.

20. *B.* The *urine* in scurvy is commonly of a dark, reddish brown, and sometimes of an almost black colour. Although it is slightly acid as it is evacuated, it very soon becomes alkaline, and emits a strong and disagreeable ammoniacal odour. Blood is often discharged with the urine, and the urine then assumes a dark reddish-brown colour, in consequence of the presence of hæmatoglobulin;

in this case it developes hydrosulphate of ammonia, and soon becomes putrid. Dr. Simon examined the urine in three cases of scurvy in Schönlein's clinical wards — two men and one woman. The urine was very similar in these three cases, in its physical characters. It was scanty, and of a deep, dark-brown colour; after standing a few hours it emitted a disagreeable ammoniacal odour. The three specimens resembled each other, and were found to approximate the chemical characters of the urine in typhus. The urea was less than in healthy urine, not exceeding 25 30ths of the solid residue. The fixed salts were diminished in the two male cases, being 14-18ths of the solid residue; but in the female they were 27, or a little above the normal average (25). The uric acid was slightly above the healthy standard in all, being from 1 to 3 of the solid residue.

21. iii. Appearances on Dissection. — Scurvy at the present day seldom proves fatal, unless in ships, or in besieged towns, where opportunities of minutely examining the bodies after death are rarely enjoyed; and the observations of early writers on this subject are generally devoid of precision, and the necessary details. The best account of the appearances after death has been furnished by Dr. Budd, from the cases which were brought to the *Dreadnought* Hospital Ship. He states, "The general inferences to be drawn from preceding facts are, that in the *inspection* of the bodies of persons who die of scurvy, the chief indications of that disease are met with in the colour of the skin, in the state of the gums, and in the presence of fibrinous effusions, and of ecchymoses, or effusions of blood. These effusions occur most frequently in the skin, in the subcutaneous cellular tissue, and between the muscles of the lower extremities, between the periosteum and bones of the lower extremities and of the jaws; and in the peritoneal coat, and in the muscular and mucous coats of the intestinal canal. The numerous traces of hæmorrhage observed in the coats of the intestines are in accordance with the frequency with which scorbutic persons pass blood by stool."

22. The slight effusions of blood between the periosteum and bone do not destroy the muscular connections between these parts, so that the latter does not generally present further alteration. Beyond a paleness of tissue, there is no change characteristic of scurvy observable in the brain. The organs of respiration, the heart and large blood-vessels, the glandular system and the bones, presented no remarkable changes in the cases inspected by Dr. Budd. His observations furnished him with no direct information respecting the *blood*, except that it is deficient in red particles; that it does not impart a stain to the lining membrane of the heart or vessels; and that it has not lost the property of coagulating. The change observed in the skin and in the complexion is to be ascribed to the alteration of the blood, and the hæmorrhages doubtless proceed, at least in part, also from this alteration. Former writers have noticed more or less of a fluid or dissolved condition of the blood, and a soft, flabby state of the *heart;* this latter change accounting for the swooning and fatal deliquium sometimes occurring in the more extreme cases. The *liver* has been found pale, or of a pale buff colour, or of a nutmeg appearance; and the *bile* in the gall-bladder of a pale or yellowish colour. The *spleen* is generally soft, of a plum colour, and often more or less enlarged. The *lungs* are sometimes œdematous, especially in their more depending parts. The *kidneys* and urinary passages seldom present any change in the uncomplicated states of the disease.

23. According to the descriptions of Poupart, Lind, and others, the blood discharged from the mucous canals during life, as well as that found in the cavities of the heart and vessels after death, was remarkably altered, fluid, broken down, and presented more or less of a greenish-black hue. The spleen was generally much enlarged, and so soft as to break down on being handled. Adhesions often existed between the costal and pulmonic pleura, and sometimes dirty serous effusions were found in the pleural cavities. Black, corrupted blood was generally effused between the muscles, or infiltrated between their fasciculi, and under the skin and periosteum; and the auricles were remarkably distended by coagulated blood, in those who died suddenly. In young subjects the epiphyses were loosened from the shafts of the long bones, and the ribs had separated from their cartilages. In some, the glands of the mesentery were more or less enlarged. The kidneys were occasionally altered. The alterations found in the bones, especially those now mentioned, most probably arose from the effusion of blood between the periosteum and osseous structure, and from the consequent destruction of the vessels of the former which nourish the latter.

24. iv. Complications, &c. — Much of the diversity observed in the symptoms and progress of scurvy, as well as in the appearances after death, depends upon the nature of the food, or of the privations causing the malady, and upon antecedent, concurrent, or intercurrent disease; for, as will be shown in the sequel, although the privation of fresh vegetables and fruit is mainly productive of it, still much is owing to the food upon which the patient has been living up to the time of his attack and during its progress. The diseases which commonly precede and favour the appearance of scurvy are agues and remittent fevers, enlargement of the spleen or liver, rheumatism, dysentery or chronic diarrhœa; and either of these may complicate, in a more or less evident manner, the scorbutic state, especially in its more chronic form, or may appear as an intercurrent malady. These complications are most apt to occur in warm or temperate climates, and wherever malaria is present; and probably the association with rheumatism is most common in colder regions and seasons. When they do appear they are readily recognised when the physician is alive to the probability of their association, and when the causes, on which they chiefly depend, are observed to be in operation. The supervention of scurvy upon ague, or upon enlargements of the spleen, or upon affections of the bowels, is not infrequent, especially in the winter and spring months, when fresh vegetables and fruits have become scarce, and when cold, humidity, and these diseases have predisposed the frame to this malady; and it was certainly much more common in former ages, before potatoes came into general use.

25. *The complication of Scurvy with Dysentery* was the most prevalent and fatal disease during

the Burmese war, and was entirely owing to the nature of the food in connection with malaria and bad water. But it is unnecessary to add, at this place, to what I have stated when treating of the *forms and complications of* DYSENTERY (see § 39. *et seq.*)—Although *rheumatism* is undoubtedly in some cases, and at certain seasons, occasionally associated with scurvy, still the pains, which are most commonly attendant upon the latter, are rather to be imputed to the infiltrations of blood which take place between the muscular fasciculi and under the periosteum, than to any rheumatic complication. A moderate attention to the matter will be sufficient to distinguish the nature of the case ; as well as the existence of enlargement of the spleen, and the connection of the disease with ague.

26. Persons labouring under scurvy are very liable, when exposed to cold and humidity, to experience severe attacks of *pleurisy*, or of *pericarditis* or of *peripneumonia*, or of *bronchitis*, which may carry off the patient in a short time, without materially influencing the symptoms of scurvy. In these cases, the dyspnœa, cough, and difficulty of expectorating become urgent ; the expectoration varying with the state of pectoral disease, from a slight mucous frothy matter, to a dirty brown, or dark-red, or sanious substance. Effusion into the pleural cavities, or effusion into the air-cells and small bronchi, and splenification of the substance of the lung, ultimately hasten or occasion a fatal issue. In rarer instances changes in the *kidneys*, which I have ascribed to cachectic inflammation of the secreting structure of these organs (see art. KIDNEYS, § 80. *et seq.*) supervene, and, by embarrassing the functions of these organs, superinduce dropsy upon the scorbutic disease, and thereby occasion or accelerate an unfavourable termination.

27. III. DIAGNOSIS.—Of the numerous writers who preceded LIND, very few pointed out with due accuracy the diagnostic characters of scurvy, or distinguished sufficiently between this disease and *malignant or putrid fevers*. In many circumstances and on many occasions, some of which I have myself witnessed, it is difficult to determine as to the presence of scurvy or of putrid fever, at first sight, or until a more patient and close observation has shown the difference, so insensibly or gradually, in such circumstances, some of which I observed in Germany and France after the last war, does the one malady approach the characters of the other. In Ireland, in 1847, owing to the failure of the potato-crop and general misery, scurvy was intimately associated with putro-adynamic fever, and it was most difficult to distinguish between them, or to say which was the primary malady. The same observations equally apply to *purpura*, which often arises from similar causes to those producing scurvy, and is more or less closely allied to, although generally distinguished from, scurvy, the more extreme points of difference between the two having been laid hold of as diagnostic characters, whilst the closest resemblances have been kept out of view. It will be more just, more conducive, moreover, to accurate pathological views, and certainly tend more to the adoption of sound indications and means of cure, to look closely at diseases as they occur in practice, to consider both alliances and differences, and to proceed in our treatment on the comprehensive basis thereby furnished us.

28. Circumstances have occurred, and may occur again, in which certain of the causes of malignant fever, as a confined impure air, crowding of numbers into a small and ill-ventilated space, &c., have come into operation, in connection with the causes of scurvy, especially a deficiency or want of fresh vegetables and fruit, and have given rise either to the petechial or putro-adynamic form of fever, or to a state of febrile scurvy, or to a disease, in which the symptoms of either the one or the other predominated, according as the causes of either prevailed. In attempting to distinguish between these diseases, or to determine the existence of either, the discriminating physician will be guided by the slow and gradual, or the rapid accession of the symptoms ; by the states of the skin, of the gums, and of the teeth ; of the general surface, and particularly of the lower extremities ; by the discolouration and other changes there observed ; by the presence or absence of complete prostration and of other febrile phenomena ; by the acuteness or intensity and duration of the malady ; by the appetite and function of digestion ; by the inability or capability of leaving the bed ; and by the presence or absence of contractions of the lower extremities, or of hardness, swelling and livid patches or ulcers in these situations.

29. In distinguishing also between scurvy and *Purpura*, the presence or absence of the majority of the above symptoms, and more especially the states of the gums and teeth, the swellings, indurations, livid blotches, œdema of, or the fungous ulcers on, the extremities ; the contractions of the joints ; and various associated phenomena, will guide the physician to a correct diagnosis, and whilst they indicate with due precision the existence of either the one or the other, will at the same time point out the close alliance between both as to their causes and their natures. (See PURPURA (§ 23.).

30. IV. THE PROGNOSIS OF SCURVY. — Before the disease is advanced so far as to present contractions, indurated swellings or fungous ulcers on the extremities ; or hæmorrhages from mucous canals ; or swoonings upon assuming the erect posture or on slight exertion, a speedy recovery will generally follow the use of the means about to be recommended ; but when the malady is thus far advanced, although the same means will often save the patient, they may also fail ; and this unfavourable result is the more likely to ensue if, with these symptoms, the patient complains of dyspnœa, and oppression at the chest ; if his respiration and pulse be very frequent ; if there be any pulmonary, pleuritic or dysenteric complication ; if dropsical effusions or albuminous urine supervene ; if the spleen be much enlarged ; and if hæmorrhages from the bowels be copious, then great danger may be apprehended, and with still greater reason, if the adoption of a suitable diet and remedies is not soon followed by any amendment.

31. In cases which present not the extreme symptoms characteristic of scurvy, and are nevertheless unamenable to the usual scorbutic remedies, some complication should be looked for and ascertained, as this most probably either retards or prevents the efficacy of such means, or the disease partakes, owing to the causes above noticed (§ 28.), more or less of the characters of putro-

adynamic or petechial fever — possesses the intermediate form already mentioned (§ 27.), and requires an appropriate method of treatment. I am persuaded, that the instances of scurvy which have been adduced of the failure of these remedies, have either been the severer, or pulmonic, pleuritic, pericardiac, dysenteric, or dropsical complications of the distemper, or those intermediate states of disease now alluded to.

32. V. Causes of Scurvy. — The causes of scurvy were only partially known until a comparatively recent period; for the disease was often ascribed to one only of the causes, and that a predisposing cause; and even now, when the chief causes have been duly recognised, others which either predispose the frame to their operation, or concur with them, and aid or determine their effects are too generally overlooked, and their influence in modifying the malady, or in delaying or preventing the beneficial operation of the means employed, is altogether neglected, or even unknown. It has been fully ascertained that several of the causes to which scurvy was formerly imputed are not really the exciting or efficient causes of this malady; but their influence as predisposing, concurring, or determining causes should not be denied, although they cannot take the highest rank in causation, or because they have been pushed from the position formerly assigned them, by others of much greater influence.

33. i. Predisposing causes. — Several of these causes were formerly believed to have had the chief share in the production of scurvy; but they are now more clearly proved to perform a less important part; but this part they fill in the causation not only of this malady, but also of dysentery, putro-adynamic fever, purpura, and probably of other diseases.—*A.* Much importance was attached formerly to living on *salt provisions*; and as this disease most frequently and certainly appeared in ships provisioned with salted meats chiefly, so it was inferred that these were the causes of its occurrence. That salted meats are not more productive of scurvy than fresh meats, or at least not much more so, is shown by the prevalence of the malady, in the spring of 1720, in an army which Kramer stated to have enjoyed an abundance of fresh meat at a low price; in the Russian armies, in 1736, which were similarly circumstanced; in the French prisoners, at the middle of last century, who had no salt provisions; and in the regiments at the Cape, in 1836, that enjoyed an abundance of fresh meat.

34. From these and other facts it may be inferred, that scurvy may appear even amongst those who have a sufficient supply of fresh meats, if there be a prolonged deficiency at the same time of succulent vegetables and fruits. Nevertheless, the question remains, are salted meats more favourable to the supervention of scurvy than fresh meats? I believe, after having paid some attention to the matter, that recently salted or uninjured salt meats, if they have been of a good and healthy description, and quite fresh when salted, are not materially more productive of scurvy than fresh meats; but whilst the quality of the latter is generally manifest, that of the former is not always so evident. The salted provisions supplied to ships have frequently been long cured, even before they are received on board, and are so often of the most inferior and unwholesome character, as to account in great measure for the appearance of cachectic maladies in those who live upon them. It was notorious, during Queen Anne's wars, that, owing chiefly to collusion between the heads of the commissariat or others in power and the contractors, and even in more recent times, that the salted provisions supplied to the navy and army often consisted not only of long or imperfectly cured meats, but also of the flesh of animals which had died of disease; that horse-flesh was often placed in casks of beef; and that similar villanous acts were not confined to salted provisions, but extended also to the flour and biscuits supplied to these services, both of these having been adulterated, and the latter mouldy and swarming in maggots and weevils. Owing to this cause, as shown by some medical writers of the day, a much greater number of human lives were lost from scurvy, scorbutic dysentery, and putro-adynamic fever—by diseases caused by the unwholesomeness of the provisions — than from all other diseases, and from naval and military actions, sieges, and other causes combined.*

35. Not only were both salted and farinaceous provisions frequently deleterious, but the supply also was insufficient to both army and navy, up to the mutiny at the Nore, the causes of which were generally misrepresented by those in power, and misunderstood or glozed over by historians. In times more recent, acts similar to the above have been perpetrated in more places than one. The returns made to the Medical Boards in India by the medical officers, and which are preserved at the India House, are full of complaints as to the unwholesome nature of the provisions supplied to the army in the Burmese war; even the rice having been either unripe or damaged. The remarkable prevalence of scorbutic dysentery, and low fever among the troops in that war, was ascribed chiefly to this cause; the mortality continuing great until more wholesome provisions were procured. But it was not only in the public services — in fleets, armies, and transport vessels — that these enormities were practised, trading vessels, emigrant ships, &c., were sometimes, and are occasionally up to the present day, supplied with the cheaper kinds of Irish provisions, which are frequently of a similar kind to that above described; and to this circumstance in part, and to others about to be noticed, should be ascribed the scurvy and fever so frequently breaking out in ships after their provisions have been used sufficiently long to produce their effects. To the unwholesomeness and nature of the food, and to the state of the water, even independently of the want of fresh vegetables and fruit, the diversity of characters presented by scurvy and fever in ships, armies, prisons, &c., is in great measure to be imputed, as well as the want of success in treating these diseases by the more usual remedies, or by those more generally found efficacious under other circumstances,—the same causes not merely

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* From a tolerably extensive field of observation in various parts of Europe and within the tropics, between the years 1815 and 1819 inclusive, I can state, that, of the various kinds of unwholesome cured meats, pork is perhaps the most injurious; especially when it has been imperfectly salted, or too long kept; and, more particularly if it have been coarsely fed, or diseased, or not cured immediately upon being killed: scorbutic and other forms of dysentery generally resulting.

predisposing to these forms of disease, but actually producing them, and giving them their distinctive features.

36. Much of the mischief observed in those who had lived long on salt provisions was formerly, and still is, by many imputed to the salt by which these are cured, or at least to the state of the provisions; and by others to the supposition that salted meats are not so nutritious as fresh. But, when these provisions have been from the first wholesome and good, have been salted while quite fresh, and have not been afterwards kept so long as to produce any sensible or unpleasant change, they may then be considered as having had no further share in the production of scurvy, even although it should have appeared during the use of such provisions, than that they have constituted the chief or only food, to the neglect of other articles requisite to correct the effects of so exclusive a diet, such as fresh vegetables and fruits. On this subject, Dr. BUDD justly remarks, that "the circumstances showing that scurvy may prevail to a frightful extent among persons living solely on fresh meat; that persons who, from the nature of their occupations, are continually absorbing saline particles, are exempt from scurvy; that scurvy is not brought on by the use of sea-water, which may be drunk with impunity, even by scorbutic people; and that the disease may be prevented for any length of time in persons who subsist on salt provisions, and can be readily cured, even in those who continue the use of them, are sufficient to justify the conclusion, that salt has no share whatever in producing it." (p. 65.) To this statement I would merely add, that the salt conceals, and partly corrects, the sensibly noxious properties of previously tainted, diseased, or otherwise unwholesome meats, and hence meats of this description, when salted, are more readily, and perhaps less injuriously, partaken of, and, moreover, have not their injurious nature made so manifest, or even suspected, as if an attempt to use them in their fresh state were made.

37. *B.* Next to the state of *meat provisions*, that of *farinaceous food* supplied to ships, armies, &c., as predisposing to, or even as producing scurvy, may be noticed. In various countries in the East, where little or no animal provision is used, scurvy has nevertheless appeared, and has been ascribed, with sufficient reason, not so much to deficiency of the amount, as to the unwholesome nature, of the food, whether rice, Indian corn, &c., which often have been damaged, unripe, mouldy, or too long kept. The flour, biscuits and other farinaceous articles, supplied by contract or otherwise to the public services, and to trading vessels, were formerly, on many occasions, similarly damaged and unwholesome, or became so after having been kept for some time; and contributed their share towards the production of scurvy, fevers, and even to visceral disease. That these articles of food have actually been productive of these maladies, was demonstrated by the occurrences in the Burmese war; native Indian regiments subsisting entirely on rice and other farinaceous articles, which in that war was more or less damaged and unwholesome, having been universally attacked with scurvy and scorbutic dysentery.

38. *C.* The *water* also, with which ships of war and trading vessels were supplied for long voyages, having been kept in wooden casks, the use of iron tanks for this purpose being of recent date, the water became offensive and unwholesome, on many occasions so much so as to be nauseous and to require the addition of spirits to prevent its more immediate ill effects. The effects of marsh water in causing bowel complaints and enlargements of the spleen and liver, are well known to many who have possessed powers of observation in connection with the requisite opportunities. But I can say from personal observation, that water, long kept in wooden casks, however well these casks may have been charred, as they sometimes are on their insides, become even more deleterious to health, and much more offensive to the senses than any water taken from marsh-grounds or land-tanks, much, however, depending upon the state of the water when filled into the casks. The greater attention now paid to the supply, state, and preservation of water in the public services, and in trading vessels, is one of the chief causes of the less frequent appearance of disease in them, and more especially of scurvy and allied maladies.

39. *D. Cold and humidity* have long been considered as very influential in favouring the occurrence of scurvy. That these causes are of some importance, I can assert, although Dr. BUDD strongly doubts their influence. But he has not viewed them in a proper light. He remarks that "the merchant seamen who enter the port of London, affected with scurvy, come almost exclusively from Mauritius, India, Ceylon, or China; and have consequently been in no higher latitude than that of the Cape." But he overlooks the circumstance that those voyages are long, and that the men have been living long upon cured meats, without a due supply of fresh fruits and vegetables; whilst most other vessels arriving at the port of London have had short voyages, they coming from much nearer countries, and consequently a sufficient period for the development of scurvy in them has not elapsed. It is not, however, the cold and moisture depending upon climate, or even upon weather, that are so influential in favouring the development of scurvy, as the cold and humidity arising from daily, and even twice daily, washing and scrubbing the decks, formerly and even still so much in use, to the neglect of dry-scrubbing and cleansing. The evaporation from the wet decks during day and night, consequent upon frequent washings during fine and dry weather, and the wet and humidity of body-clothes, bed-clothes, and hammocks, produced by these washings, and during foul or stormy weather, are the forms of cold and humidity which, on ship-board, predispose to scurvy, and more directly produce the several forms of rheumatism, chiefly by suppressing the cutaneous functions, by reducing nervous power, and thereby causing the accumulation of those excrementitious matters, the retention of which occasions these maladies. All the most experienced writers on scurvy have remarked the suppression of the cutaneous functions previously to the appearance of, and during the progress of scurvy, and I have no doubt of the fact from my more limited observation.

40. *E. Impure air* has been considered by some writers as predisposing, more or less, to the appearance of scurvy. The testimony of LIND, TROTTER,

and **Blane**, most experienced physicians, is opposed to the opinion, that it has any influence either in the production, or on the course of this malady. That the influence is not very remarkable, may be admitted; but that this cause is not altogether without effect cannot be denied, especially in modifying or altogether changing the characters of the disease, when conjoined with those causes which more directly and commonly produce scurvy. It was observed in the American squadron, in 1846, that scurvy was most severe in vessels which were the worst ventilated.

41. *F. Several other diseases* predispose the frame to the appearance of scurvy; and although the predisposing influence has been attributed to the debility produced by those diseases, yet I believe that it is not the debility alone which predisposes, but more especially the nature of the malady. Agues, remittent fevers, enlargement of the spleen, and rheumatism, and previous disorder of the digestive organs, especially the former, have been generally considered by medical writers as more or less influential in the production of scurvy. The previously impaired assimilation and nutrition, and the consequent state of the blood, in connection with exhausted organic nervous energy, readily account for the readiness with which scurvy supervenes upon those maladies when its causes are in operation.

42. *G. The state of the mind* is influential both in predisposing to, and warding off scurvy; the depressing passions favouring the appearance, and the exciting emotions preventing or delaying the occurrence of the malady. Disappointed expectations; anxiety; hope deferred; longings to return to more desired scenes; prolonged confinement; a want of exciting, amusing, and exhilarating occupations; breathing the same kind of air, in the same locality; a monotonous and unexciting course of existence; losses of relations and friends, and extinction of those hopes or expectations which render privations endurable, — all have their influence in predisposing the body to scurvy or its allied states of cachexy.

43. *H. The seasons* have no small influence on the appearance of scurvy, but mainly in consequence of the privation of fresh vegetables and fruits, which is experienced chiefly during winter and spring; so that, in armies, as well as in fleets in, or departing from, cold or temperate countries, a deficient supply of those dietetic means of prevention is more likely to be experienced at those seasons than at any other. Suppressed perspiration, produced by the cold and humidity of these seasons, may also not be altogether uninfluential, as shown above (§ 39.), in favouring the evolution of this malady. In northern countries, where the inhabitants, the seamen, and the soldiers, live chiefly upon cured meat provisions, as salted and smoked meats, and dried fish, during winter and spring, and until the commencement of summer, when vegetables and fruits begin to appear, their constitutions have made considerable progress to the scorbutic diathesis; so that, when these preventive articles of diet cannot be obtained at this latter season, owing either to states of siege, and to the provisioning and other circumstances of armies or fleets, scurvy is then much more apt to break out in spring, and even in summer, than at other seasons.

44. *I.* The earlier writers on scurvy were inclined to ascribe a *contagious influence* to this disease, chiefly from the number attacked with it in the same place and circumstances; but it was clearly shown that contagion had no share in producing it, by **Lind** and others, who wrote about the middle and end of the last century, the causes inducing the malady being common to all affected by it in the same locality. But although the disease is actually uncontagious, it is by no means unreasonable to infer, that the putrid emanations from a number of persons in an advanced stage of the disease, confined often in very limited spaces, either on board of ships, in the crowded hospitals of a besieged town, or in crowded prisons, are not altogether innocuous, or are not without some influence in predisposing the body to this or some allied malady, arising from the contamination of the circulating fluids, and from the depression of vital or organic nervous power, by the accumulation of these emanations in the air which is respired for a longer or shorter time. Nor would it be improbable that the emanations arising from a number of scorbutic patients, in places insufficiently ventilated, may convert the scorbutic malady into putrid, maculated, or putro-adynamic fever, or into scorbutic dysentery, or even may more directly develope these diseases.

45. *K. Age and sex* have probably but little influence on the production of scurvy, for it is observed at all ages, and in both sexes; but there is no doubt that it occurs much more frequently in adults, or from early puberty until far advanced age, than in children, and in males than in females, chiefly in consequence of the greater exposure of adult males to the causes, owing to the circumstances in which they are liable to be placed.

46. ii. The exciting causes of Scurvy may be briefly stated to be the use, for a longer or shorter period, of all kinds of animal meats, too long or imperfectly cured or preserved; of dried, or smoked, or tainted meats or fish; or mouldy, old, damaged, diseased, or unripe farinaceous articles of food, to the exclusion of, or without possessing the advantages of, fresh or succulent vegetables and fruits, or of other preventive articles of diet, or of medicine; more especially when the use of the former kinds of food, and the want of the latter, are aided by one or more of the predisposing or concurring causes already considered. That the want or neglect of those vegetable productions which have been found so beneficial, both in preventing and in curing scurvy, has a greater influence in the production of the malady, than even the prolonged use of the several kinds of animal food, however cured or preserved, has been proved on various occasions. But it cannot be denied, that damaged, tainted, or too-long-cured substances, — pork, the viscera and blood of the animals generally used for food, — the flesh of animals which have died of disease, &c., are much more likely to occasion scurvy, and its various complications, than fresh and wholesome meats; although even these last may be followed by the disease, when too long or exclusively used, and when fresh vegetables and fruits cannot be obtained.

47. Although I cannot admit that scurvy is to be ascribed entirely and always to the absence or want of fresh succulent vegetables and fruits, as articles of diet, as contended for by Dr. **Budd**, yet I will not deny that such a privation is the most common and exciting cause of the malady, espe-

cially when no suitable means are employed—none of the numerous preventives about to be noticed (§ 54. *et seq.*) is had recourse to, in order to supply the deficiency, or to counteract the effects resulting from the nature or state of the aliments. In this, as well as in other diseases, we cannot with propriety ascribe the sole agency to one cause; generally more than one, frequently several, although of diversified amount of power, are concerned in developing the result, whether that result be simple, definite, or specific, or whether it be complicated more or less, or contingently associated.

48. iii. *The chief causes insisted on by writers on this disease,* were often approaches only to the truth; but these approaches were sometimes so near, as to lead to judicious means of prevention and cure, although certain subordinate agencies were often overlooked. ECTHIUS, one of the earliest writers on scurvy, assigns as causes, "gross, unwholesome food of salt, dried, or semi-putrid flesh and fish, pork, spoiled bread, stinking water, &c." RONSSEUS ascribed the frequency of scurvy in Holland to the diet and air, to eating quantities of water-fowl, but chiefly to living on flesh first salted, then smoked and dried, and to the season and weather. WIERUS, who probably viewed cases of psoriasis as modifications of scurvy, and in this agreed with many who both preceded and followed him, more justly remarked the not infrequent connection of scurvy with ague and malignant forms of fever; and, with sufficient reason, ascribes this distemper "to unwholesome air, and chiefly to such bad or corrupt food as was used in northern countries, and by their shipping, viz., stinking pork, smoked rancid bacon, mouldy bread, thick, feculent ale, bad water, melancholy and grief of mind, preceding fevers, the stoppage of usual evacuations, &c." DODONÆUS imputed the scurvy in Brabant, in 1556, to the use of corrupted rye during a season of scarcity. ROSTOCK, in a treatise published in 1589, remarks, that impure water and bad air aid unwholesome food in producing scurvy, and states, that the disease is endemic in several northern countries, and that scorbutic mothers often there bear scorbutic children, and often miscarry, or bring forth dead fœtuses. BRUNNER insists upon the influence of damp, marshy localities, and other sources of malaria, in producing scurvy, and ascribes more to the nature of the bread used by the inhabitants of those localities than previous writers. HORSTIUS likewise insists upon the influence of malaria, and the use of new ale, without hops or any other bitter, in causing scurvy in various places in the North of Germany. VANDER MYE notices, more particularly than any previous writer, the influence of the emotions and passions of the mind in causing and in preventing scurvy, and adduces the effects of occurrences which took place during the siege of Breda, in support of his views. In this siege he attributed the disease chiefly to the general use of old, spoiled, or musty rye, and to humidity; but other causes, both physical and moral, were also in operation. He adds, that "the distemper proved most fatal to the English soldiers, as they very early began to feed on dog's flesh, were in want of their beloved tobacco, and lay in the most wet or damp barracks. It was much less frequent among the Walloons and Flemings, they being more careful and delicate in their diet, and having much wholesomer quarters. Amongst the French it was more rarely met with, owing to their being stationed in the driest part of the town, and to their more sprightly dispositions."

49. J. HARTMANN takes notice of the influence of mercury, and of mercurial courses, in predisposing to scurvy. In 1645, the medical faculty of Copenhagen published a consultation on the causes, prevention, and cure of the distemper, for the benefit of the poor of the country; and in this meritorious production, the influence of cold, humidity, malaria, and of unwholesome water and beverages, is insisted upon, as aiding the effects produced by food such as that already mentioned. MARTIN LISTER, and many of preceding and contemporary writers, and subsequently COCKBURN, PITCAIRN, BOERHAAVE, and others down to the appearance of BACHSTROM's work, in 1734, agree in ascribing scurvy to the use of unwholesome food and water, or to those causes chiefly which had been mentioned by their predecessors. But the last-named author was the first to demonstrate that, however much the food and water used were concerned in occasioning scurvy, *abstinence from recent vegetables was the chief cause of the malady, and the use of these the chief prevention and cure.* Notwithstanding this very decided opinion, and the very conclusive evidence BACHSTROM furnished of its truth, the disease has been imputed by writers, down almost to the present day, rather to the prolonged use of cured provisions, than to the want of fresh vegetables and fruit. But it is unnecessary to pursue this part of the subject any further.

50. Dr. LIND states that scurvy most commonly occurred on land in persons who subsisted chiefly on dried, or smoked, or salted flesh or fish, and the unfermented farines; or upon bread made of peas, or a composition of peas and oatmeal. KRAMER states that, in his time, this distemper appeared most frequently among those who lived altogether on boiled pulses, without any green vegetables or summer fruits. The occurrence of the disease among the Russian troops, whose chief food was rye-bread and meal, has been already noticed. Scurvy appeared among the inmates of a lunatic asylum in India, whose food consisted chiefly of rice and split peas; and Mr. MACOLMSON mentions the occurrence of the distemper in the same country among prisoners kept on bread and water. That various kinds of bread, especially when long kept, will occasion scurvy, or at least not prevent it, I believe, when they are not accompanied with succulent vegetables or fruits. But something is also owing to insufficiency, as well as sameness of diet, to living in a state of confinement, to breathing the air of the same place or habitation, and to the duration of this state of confinement: for it has always been remarked, that when this latter cause has been concerned in producing the disease, the first cases have been those longest confined. It may also be noticed, that the influence of farinaceous food in occasioning scurvy, is great in proportion to the length of time the articles have been kept previously, or subsequent to their usual modes of preparation, and to their healthy, or ripe, or untainted condition when predared. And it should be recollected, that flour, if sound and fresh, is more likely to prove beneficial when baked or otherwise prepared, shortly before it is used, than when it has been made into bread or biscuits a long time previously.

51. The prevalence of scurvy during 1847 and 1848, in Ireland, Scotland, and some parts of England, was very generally ascribed to the failure of the potato-crop. But in some places in Scotland, Dr. Christison imputed the disease to the privation of milk — an opion which has been negatived by numerous observations of the prevalence of scurvy where the supply of milk was abundant.

52. VI. THE NATURE OF SCURVY may be inferred, with tolerable accuracy, especially as respects every practical purpose, from what has been adduced. But it is obvious, that the numerous occurrences of the distemper, both on land and at sea, as described at least by the majority of the writers referred to in the *Bibliography*, were associated with the appearance of one or more of those maladies, of which I have pointed out the relations with scurvy (§ 27. *et seq.*); and that, with many cases of scurvy, both simple and complicated, others of a different nature, as psoriasis, and various chronic eruptions, also appeared. To these circumstances, — to the extended signification thus imparted to the name, as well as to the complications it actually manifested, — are to be ascribed the diversity of description, and the numerous and complicated subdivisions of the malady, contained in works upon it during the 17th and 18th centuries. Opinions as to the nature or proximate cause of scurvy were no less diversified, and even numerous. Without attempting to adduce these opinions in full, or to connect them with their authors, it may be briefly remarked, that they generally agreed with the pathological doctrines of the day in which they respectively appeared, and were assigned by their authors, without any satisfactory proofs—were mere suppositions, or, at best, inferences from loosely-observed phenomena. Whilst some writers imputed scurvy to an acid state of the blood, others ascribed it to an alkaline condition of this fluid, and some even, to make more sure of the fact, considered that acidity in certain cases, and alkalinity in others, were its actual causes, the predominance of either condition giving rise to the different forms of the malady. These views not proving satisfactory, especially to those who had opinions of their own to propose, the existence of a predominant saline condition of the blood was supposed and accredited by many. But the particular salt was never shown, some considering it to be an acrid salt, others a rancid salt, and so on. Then came a viscid state of the blood to be asserted, then a vitiated as well as a viscid condition, and even the existence of a putrid ferment in the blood to be inferred. More recent writers considered that a simple dyscrasis of the blood only existed; others, not content with the simplicity of this view, thought it necessary to impart to it some special property or chemical quality, and contended that the dyscrasy was acid; and some were positive as to the dyscrasy being alkaline. Lastly, we find the distemper referred to the existence of a dyscrasis produced by the evolution of an acid ferment in the blood; the chief reason for the existence of this ferment being that an alkaline ferment could not exist; but the particular acid was not shown.

53. The chemical pathologists of the present day have not thrown much more light upon this part of the subject than their predecessors, each of whom considered his opinion as good as the former believed their own to have been. Dr. CHRISTISON supposes that scurvy arises from the want of vegetable albumen or animal casein in the food; and Dr. GARROD believes that the malady is caused by the absence of potash, and that potatoes, and other antiscorbutics owe their virtues to the potash they contain. Dr. ALDRIDGE contends for the influence which should be ascribed to a deficiency of phosphorus, sulphur, lime, and the alkalies, in occasioning scurvy. That something may be owing—a part merely—to the causes contended for by Dr. ALDRIDGE is not improbable. But it is unnecessary to pursue this subject any further than very briefly to state, that one of the most evident changes from the healthy condition is seated in the blood; but that this change is probably not the earliest in the procession of morbid phenomena, as it most certainly is not the only or the most advanced. That the change of the blood is, manifested by the sensible or physical properties, as well as by the chemical constitution of this fluid, will readily be admitted; and that, in consequence of this change, the several solids of the body are more or less affected, will also be conceded; but I contend that these are not the only alterations; for the vital qualities of the blood itself are more or less altered, or rather impaired, — those vital qualities which the blood derives from the organic nervous system, through the medium chiefly of the vessels in which it circulates. That the organic nervous system is early affected, either primarily, or through the medium of the blood, or in both modes, is shown, not merely by the functions, but also by the vital cohesion and organization, of the viscera and tissues which this system supplies and vitally actuates. But it is immaterial whether this system or the blood be the part primarily affected; for there can be no doubt that morbid states of the chyle, occasioned either by the nature and quality of the aliments, or by the defect of certain elements consequent upon the want of the requisite vegetable productions, or by both causes conjoined, will affect the assimilating functions, both by impairing organic nervous power, and by altering the constitution of the blood; the slow and gradual progress of these changes giving rise to all the structural, as well as functional alterations characterising the advanced stages of the malady.

54. VII. THE PREVENTION OF SCURVY.—*A.* The efficacy of *limes*, *lemons*, *shaddocks*, *oranges*, and *pomegranates*, in preventing scurvy, was known to several of the earlier writers on the disease, one of whom is quoted by LIND, in proof of the use thus made of these fruits by the Dutch seamen. ROUSSEUS, ALBERTUS, and other writers in the 16th century, make particular mention of lemons and oranges for the prevention and cure of scurvy. Although particular and convincing proofs of the efficacy of these were thus early furnished, not only by the Dutch, but also by some of our own early navigators, and subsequently by Admiral WAGER, and others, insufficient attention was paid to the use of these fruits until the appearance of Dr. LIND's celebrated work on scurvy, at the middle of the last century. Notwithstanding the evidence so conclusively adduced by this able writer, these means of preventing scurvy were nevertheless more or less neglected, or were left to the caprice or choice of commanders and others, until the

efforts of Blane, Blair, and Trotter, towards the end of that century, succeeded in procuring the adoption of lime-juice for the naval service. The lemon and lime-juice now supplied to the navy, is preserved by the addition of one part of strong brandy to ten of the juice. But when the fruit can be procured, it is generally preferred, and is used, especially when it is actually required, with much pleasure and relish.

55. *B.* Other *fruits*, particularly those of an *acid nature*, and even the *sweet fruits* before they are ripe, are more or less efficacious in the prevention and cure of scurvy. Dr. Trotter states that, having remarked that scorbutic slaves threw away ripe *guavas*, while they used the green fruit, he resolved to try the effects of such. He selected nine negroes, equally affected with scurvy. To three of those he gave limes, to three green guavas, and to three ripe guavas. They were served by himself; and at the end of a week, those who were restricted to the ripe fruit were nearly as before the experiment, while the others were almost well. M. Fodéré states, that the good effects of *unripe grapes* were very apparent in the scorbutic cases of the French army of the Alps, in 1795. Sir J. Pringle recommended *apples* as a preventive in 1776; and Dr. Trotter remarks that, "when Lord Bridport's fleet arrived at Spithead, in September, 1795, almost every man in the fleet was more or less affected with scurvy. Large supplies of vegetables were provided; and lemon-juice being scarce, in consequence of the previous great consumption, fifty baskets of unripe apples were procured for the use of the fleet. The *Royal Sovereign*, in particular, derived great benefit from them;" and the cure of the disease was every where most speedy. *Tamarinds*, and most of the acidulous fruits of warm and hot climates, are more or less anti-scorbutic. When scurvy was prevalent among the troops at Rangoon, during the Burmese war of 1824, the *Phyllanthus emblica*, or anola, which has a rich, acid taste, was employed as an anti-scorbutic with much benefit.

56. When Bachstrom asserted, in 1734, that scurvy was the result of a more or less protracted privation of fresh vegetables and fruits, he stated at the same time both its prevention and its cure; and although certain vegetables and fruits accomplished these purposes more quickly and fully than others, all those which are edible possess more or less of these beneficial properties. The writers of the 16th century have generally noticed the popular use of *scurvy-grass, brook-lime, water-cresses*, &c., for the prevention and cure of this distemper. All succulent vegetables and plants comprised in the order *Cruciferæ*, are more or less efficacious, especially the *radish, horse-radish, turnip, carrot, cabbage*, &c.; and even such of these as are commonly only used when boiled, are most efficacious when taken raw and fresh from the ground. Dr. Lind very justly insists upon this circumstance, and remarks that herbs in form of salads, are more efficacious than when boiled; and that their anti-scorbutic properties are destroyed by drying, as shown by Kramer, and by the results observed from the anti-scorbutic herbs sent from Vienna to the army in Hungary. *Onions, garlic, leeks*, and *potatoes* are all very decidedly anti-scorbutic, and as these may be preserved for some time, they are most beneficial for the provisioning of ships or armies. The very general use of potatoes in modern times, partly accounts for the remarkably less prevalence of scurvy at the present day than formerly.

57. Most of the articles which are anti-scorbutic, may be preserved by *pickling*, especially by the pyroligneous acid or vinegar, and retain in a great degree their virtues. The immunity of Dutch vessels from scurvy has been ascribed by Dr. Kerr and others to the use of *sour kroute;* and the health of the crew of the *Centurion*, during Captain Cook's voyage, was considered to have been owing to a liberal supply of this anti-scorbutic.* The quantity usually allowed of this substance was two pounds' weight to each man per week, besides a pound and a half, or two pounds, with every gallon of peas, for making soup.

58. There is no northern country where scurvy is generally endemic during winter, spring, and the early part of summer, that does not furnish a supply of anti-scorbutics, if duly recognised and preserved for these seasons. In Norway, Greenland, Iceland and Lapland they employ *scurvy-grass, sorrel*, and various other warm and acid herbs. Sir E. Parry, in his first polar expedition, experienced the advantage of sorrel in the cases which occurred among his crews. He states that sorrel was preferred by the Esquimaux to scurvy-grass. He adopted also the advice of Bachstrom and Lind, and raised small quantities of *mustard-and-cress* in his cabin, in small, shallow boxes, filled with mould, and placed along the stove-pipe; and as much of these were thus produced, although etiolated from want of light, as to prove beneficial to the scorbutic cases.

59. *C.* There is, perhaps, not any vegetable production more remarkably anti-scorbutic than the tribe of *firs*, especially the spruce-fir and common fir, and mountain-pine. Moellenbroek states, that when the Swedish army, at war with the Muscovites, were attacked with scurvy, Dr. Erbenius prescribed a *decoction of fir-tops*, by which the most deplorable cases were cured, and the rest of the troops protected from the distemper. Two squadrons of ships fitted out by Russia in 1736, were obliged to winter in Siberia, and their crews became affected with scurvy. After attempts to discover a remedy, the pines which grew plentifully on the adjoining mountains were hit upon; and by these all the men recovered in a few days (Gmelin, *Flor. Siber.*, p. 181.). Dr. Lind remarks, that pines and firs, as well as the shrub called the black spruce, have all analogous medicinal virtues, and great efficacy in the prevention and cure of this disease. "A simple decoction of the tops, cones, leaves, or even green bark and wood of these trees, is an excellent anti-scorbutic: but it becomes much more so when fermented, as in making spruce-beer, where the *molasses* contri-

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* Dr. Kerr, in his able treatise on scurvy, remarks, that "Sour kroute or croute (*sauer kraut*, Germ.) is prepared by slicing the soundest and most solid cabbages in the way cucumbers are used in this country. In this state they are put into a barrel in layers, hand high, and over each is strewed a handful of salt and carraway seeds: in this manner it is rammed down, stratum supra stratum, till the barrel is full, when a cover is put over it, and it is pressed down with a heavy weight. After standing for some time in this state, it begins to ferment; and it is not until the fermentation has entirely subsided, that the head is fitted to it, and the barrel is finally shut up and prepared for use."—*Cyclop. of Prac. Med.* vol. iii. p. 691.

butes, by its diaphoretic quality, to make it a more suitable medicine. By carrying a few bags of spruce to sea, this wholesome drink may be prepared at any time. But when it cannot be had, the common fir-tops should be first boiled in water, and the decoction afterwards fermented with molasses, in the common method of making spruce-beer, to which a small quantity of wormwood and horse-radish root (which it is easy to preserve fresh at sea) may be added."

60. *Tar-water* was formerly strongly recommended as an anti-scorbutic; but the extravagant praises bestowed upon it at the commencement of the last century, greatly injured its just reputation. Dr. Lind still continued to uphold it; and many years ago, I had occasion to have recourse to it as a preventive, when placed in circumstances most likely to occasion this distemper, and when no other means could be obtained.* There are many reasons to believe, that all the *terebinthinates* are anti-scorbutic; and that, when the disease is attended by hæmorrhage, there is no substance so efficacious as the spirit of turpentine, when taken in small and repeated doses, in arresting the hæmorrhage, in restoring the tone of the extreme vessels, and removing the contractions of the joints. With this impression, I recommended Sir E. Parry to have a supply of this medicine in his last polar expedition; and he adopted the recommendation. The *anuda tree*, to which Cartier attributed the remarkably quick recovery of his crew, is considered by Lind to have been the leaves and tops of the American spruce; and it, as well as the other pines and firs, evidently owed much of its virtues to the terebinthinate principles it contained.

61. *D. Molasses* have been considered by Lind and others as anti-scorbutic; and Sir G. Blane states, that the ship in which it was first tried, was the only one in the squadron that was free from scurvy, which prevailed so much in the other ships, that, on their return to Portsmouth in August, 1780, 2400 men were sent to the hospital with this disease. Subsequently, molasses was served with rice to the men who were scorbutic, or threatened with scurvy, in Lord Howe's fleet; and the benefit derived from it was so great, that it was made for some time a regular article in the victualling of ships. Nevertheless, the malady was not entirely prevented; and in some vessels well supplied with it, scurvy prevailed to a great extent. Dr. Budd believes, that the anti-scorbutic properties of sugar-cane are greater than those of molasses; and that they are much impaired by the process employed in the manufacture of sugar. I consider this opinion to be correct, from what I have observed in warm climates.

62. An anonymous work on scurvy, published in 1767, recommended the use of *wort*, or an infusion of malt, as an anti-scorbutic; and this substance was afterwards favourably noticed by Dr. Badenoch. Captain Cook employed it in the *Centurion*, and spoke highly of its efficacy. He took with him a large supply of malt, with which to make wort; of this from one to three pints were given daily to each man. Sir G. Blane states, that the fleet in the West Indies was supplied with the *essence of malt*; that it proved of service, but that its anti-scorbutic properties were inconsiderable. The process of extracting the essence very probably impaired the properties possessed by the infusion.

63. *E. Various fermented liquors* have been used as anti-scorbutics, some of them from times immemorial, in northern countries. In Norway, in the Feroe and Shetland Isles, the inhabitants have, from the earliest ages, used, as their common beverages or drink, two kinds of fermented liquors; the one consisting of the fermented serum of butter-milk, or of fermented butter-milk, the caseous matter being removed as the fermentation proceeds; the other being an infusion of the bran or husks of oats and barley, that is fermented after the chief part of the farinaceous deposit from the infusion is removed. This deposit takes place from the infusion after this latter is poured off, or otherwise separated from the bran or husks. The infusion is then allowed to ferment, and the farinaceous deposit is removed, and used as an article of diet. These are very agreeable beverages, especially during the advanced stages of their fermentation, and constitute the common drink of the inhabitants. They are the chief means of averting scurvy in these parts, where fresh vegetables are either scarce, or not to be obtained, during a great part of the year, and where fruits are almost altogether wanting.

64. In all the continental countries bordering on the Baltic, and Northern and German oceans, *spruce-beer* is the most generally and most efficaciously used as a preventive of scurvy; vessels from Denmark, Sweden, Holland, Riga, Dantzic, &c., being generally provided either with it or with the essence of spruce, for their anti-scorbutic properties. Spruce-beer is beneficial, not only for the prevention and cure of scurvy, but also in the treatment of most fevers of a low type, and of several cachectic diseases; in all of which I have, since the commencement of my practice, frequently prescribed it. As shown above (§ 59.), it may be readily prepared from the materials which are easily procured, and as easily carried about. *Cyder* and *perry* are amongst the most decided anti-scorbutic beverages in use in this country, and were long ago shown to be very serviceable by Sir J. Pringle and Dr. Lind. *Small-beer*, in a state of brisk fermentation, is also anti-scorbutic, especially when a sufficient quantity of hops, or of a vegetable bitter, has been added. Sir G. Blane and others have made a favourable mention of *malt-liquors*, and I have seen them used with advantage, especially *porter*, when bottled and well preserved.

65. The several kinds of *wine* are more or less

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* The author of this work, in the winter of 1817 and 1818, was a passenger to England in a vessel, which was detained by bad weather at sea during thirteen weeks and four days, and which was provisioned and watered for seven or eight weeks only. He fortunately had laid in a small stock of articles for his own use; but, nevertheless, it was found necessary, after some time, to place every one on an abridged allowance of food and water. The meat provisions were altogether long salted, and were chiefly pork; the biscuit was coarse and mouldy. The water ultimately also was short in quantity, turbid, bluish, and most offensive. There fortunately was a very moderate supply of potatoes. During thirteen weeks no land had been seen, nor any other vessel communicated with. In this predicament — which, however, was not the only or the most dangerous one,— the author caused a small quantity of *tar* to be put into the water before it was used for drinking, and a little spirit was added. To these means, aided by a very moderate supply of potatoes, he attributed the preservation of the crew from scurvy and scorbutic dysentery, every person arriving in the Downs in good health notwithstanding the unwholesome supply of food and water, and the unfavourable season.

anti-scorbutic; and they are rendered still more so by the addition of vegetable bitters and aromatics, more particularly absinthium, calumba, cascarilla, ginger, orange and lemon-peel, &c. It has been observed that scurvy was rare in French ships of war in which the wines of their country were served out to the crews. Sir G. Blane, Dr. Lind, and Dr. Bryson agree in reprobating the use of spirituous liquors. There can be no doubt of the injurious tendency of these when taken in excess, or habitually, or undiluted. But used in small quantity, largely diluted, and added to the more common anti-scorbutic beverages, or to bitter vegetable infusions, they are decidedly beneficial, both in the prevention and cure of the distemper. There are various contingencies which occur to voyagers, requiring a cautious and moderate recourse to one or other of these liquors; and, in circumstances threatening the outbreak of scurvy, the addition of a small quantity of either of them to the means of prevention in common use, has a very beneficial influence upon the spirits and constitution of those who thus abstemiously use them, and promotes the good effects of the more efficacious anti-scorbutics, especially during exposures to cold and humidity.

66. *Vinegar* was early employed as an anti-scorbutic, and our fleets were generally supplied with it during the last century. Dr. Lind, Sir G. Blane, Dr. Trotter, and others, have shown that the distemper prevailed in ships which were well supplied with this article. Much, however, depends upon the kind of vinegar employed. The pyroligneous acetic acid certainly possesses considerable anti-scorbutic properties; much apparently depending upon the source and the preparation of this article. Dr. Budd remarks, that he has observed scurvy in ships well supplied with vinegar; but the disease, in its most aggravated form, has appeared amongst those crews which had no regular allowance of this article.

67. *F.* The *mineral acids* have been found but little influential in the prevention and cure of scurvy. Dr. Lind took twelve patients on board of the *Salisbury*, at sea; their cases were quite similar. They lay in one place, and the diet was the same for all of them. Two of them were ordered a quart of *cyder* daily; two others took twenty-five drops of *elixir of vitriol* three times a day; two had two spoonfuls of *vinegar* thrice a day, and their food well acidulated with it; two were put on a course of *sea-water*, about half a pint having been given every day; two had each two *oranges* and one *lemon* daily; and two had the size of a nutmeg, three times a day, of an *electuary* made of *garlic, mustard-seed, rad. raphan., balsam of Peru,* and *myrrh;* using barley-water, acidulated with *tamarinds,* for drink. The oranges and lemons were the most speedily beneficial; next to those the cyder: those who took the other medicines were, at the end of a fortnight, much in the same state as those who had taken only lenitive electuary and cream of tartar as an aperient.

68. *G.* There are numerous medicines besides those already mentioned, which are more or less useful in preventing as well as in curing scurvy. Most of the more *succulent* and *acidulous* vegetables, plants, and fruits, especially when fresh, or preserved by pyroligneous vinegar, are beneficial; but many of them lose their anti-scorbutic virtues when dried, and others when boiled. Of the medicines which may be used, and which are certainly occasionally serviceable, even when other means have failed, I may mention the *chlorate of potash, nitrate of potash, camphor,* the *chlorides, lime-water* and the *chloride of lime, chlorine, chlorinated water* and *chlorinated soda, sarsaparilla, serpentaria, sassafras, capsicum, taraxacum, guaiacum, mezereon, senega, elm-bark, dulcamara,* the several *balsams,* &c.; but these are severally only of use for certain modifications and complications of the malady.

69. It has been frequently supposed, and the supposition too often acted upon, that *fresh meat* is of itself sufficient to prevent or to cure scurvy when it breaks out in ships, and this opinion may supersede the opportunity of procuring fresh vegetables and fruits. Dr. Budd states, that during the year in which he wrote on this disease, "the captain of a vessel trading to the Mauritius furnished his men, while they stayed at the island, with a plentiful supply of fresh beef, procured at considerable expense, but neglected to provide them with vegetables and limes which abound in the island. The consequence was, that scurvy broke out soon after they set sail, and before the ship arrived in this country one half the men before the mast had died of it, and the rest were disabled." (p. 77.)

70. *H.* It is not alone requisite to use the above means of prevention, as they may severally be possessed by individuals or communities, under circumstances which render the appearance of scurvy either probable or certain; but all the *predisposing and exciting causes* (§ 33. *et seq.*) *ought to be carefully avoided,* as far as this can be effected. I believe that no mean cause of the prevalence of scurvy in the navy, as well as in trading ships, was the habit, morning and evening, of washing the decks, thereby keeping in a constant state of humidity and evaporation, and the air either cold and humid, or close and humid, according to concomitant circumstances. This evil is partly abated by adopting dry scrubbing and similar means; but it still should be kept in recollection, as the adoption of it depends upon the knowledge or caprice of the captain, who in this, as well as in other matters connected with naval service, may, thus occasion an unhealthy state of air, an artificial malaria, the humidity favouring the concentration of emanation from the hold and other parts of the ship, and from the individuals confined during the night in a limited space and in a close air. Harassing duties, fatigue, and whatever lowers the general standard of health, or depresses the vital powers, ought also to be avoided.

71. *I.* Much, as will be seen from the above, depends upon the victualling of ships, especially those which proceed upon long voyages. The sailors should have a sufficient supply of cocoa, tea, coffee, fresh lemon-juice, sugar or molasses; and whilst spirituous liquors are allowed, in very moderate quantity, and only when wet or fatigued, they should either be withheld, or allowed in very small quantity only, when these exigencies do not exist. In circumstances tending to depress the mind, endeavours should be used to amuse and to excite it, in such ways as may the least tend to be followed by any depression. In these respects, as well as in others, the means adopted by Sir E. Parry deserve both praise and adoption, as far as the latter is possible.

72. VIII. Treatment of Scurvy.—What has already been stated with reference to the *prevention* of scurvy, applies equally to the *treatment* of it, especially in its early stages, and less complicated or less severe states. But it is occasionally observed, that, owing either to the continued influence of certain causes which are overlooked, or cannot be removed, or to the presence of some complication, the disease resists the usual means of cure, and even those remedies which have generally been efficacious in the most severe cases. *Lime-juice*, and especially fresh *lemons* and *limes*, have been found the most efficacious means of cure in pure scurvy; but instances have been recorded very recently, in which lime-juice has failed. These instances of failure have, however, been adduced in too general terms, and without a sufficient and precise record of the several circumstances in which the failure occurred, or of the particulars in which the disease varied in its character from that usually observed. The distemper has commonly been stated to have been scurvy arising out of the usual causes; and lime-juice has been said to have been given without benefit; but no particulars are adduced as to the existence or non-existence of one or more of those predisposing and concurring causes described above (§ 33. *et seq.*), as not merely contributing to the production of the malady, but also actually perpetuating, modifying, or aggravating it, if they are allowed to continue in operation during the treatment. When lemons, limes, shaddocks, and oranges can be procured, they are preferable to other means; but, otherwise, the preserved lime-juice, or crystallised citric acid, should be substituted. In respect of the preserved juice, we have no adequate information as to the time it will retain its anti-scorbutic properties; for it is not unreasonable to infer, — indeed it has been proved — that, when this juice has been kept two or three years, as is not infrequently the case, it may have lost much of its virtues, the failure of it under such circumstances being sufficiently evident, without looking for the cause of failure in the nature of the disease itself, or in the inefficacy of the remedy.

73. One of our oldest English writers on scurvy, John Woodall, in his meritorious work entitled the "Surgeon's Mate,"—a name too vulgar to be noticed by doctors of modern manufacture,— observes that "we have many good things that heale the scurvy well on land, but the sea chirurgeon shall do little good at sea with them, neither will they endure. The use of the juyce of lemmons is a precious medicine, and well tried; being *sound and good*, let it have the chiefe place, for it well deserves it; the use whereof is: it is to be taken each morning, two or three spoonfulls, and fast after it two hours; and if you add one spoonful of *aqua vitæ* thereto, to a cold stomach, it is the better. Also, if you take a little thereof at night, it is good to mixe therewith sugar, or to take of the syrup thereof is not amisse." This good advice was given in 1636, and further insisted upon subsequently, by Martin Lister, Dellon, and many others; and yet when Lord Anson proceeded on his circumnavigation, no provision of the kind was made against scurvy; the prevention and cure of disease, and rewards for those who devote themselves to those laudable undertakings, never having been considered of any importance by British Governments, or, at least, of very minor importance only; the aggrandisement of party and family connections always absorbing and utterly annihilating considerations of public justice and patriotism.

74. Since the works of Lind, Trotter, and Blane established the reputation of lemon-juice, and acidulous fruits, for the cure of scurvy, these, with the use of fresh succulent vegetables, have been generally adopted. Nevertheless, other means have been resorted to, owing either to the failure of the lemon-juice, or to the form of, and circumstances attending, the malady. The other vegetable acids, and the mineral acids, have been found very remarkably inferior to the citric in the treatment of scurvy; but the amount of benefit which various kinds of salts, and the alkaline carbonates, are capable of affording, has not been ascertained, excepting in the single instance of nitre. Mr. Patterson, a naval surgeon, writing in 1794, showed the good effects of a solution of *nitrate of potash* in *vinegar*. He advised four ounces of nitre to be dissolved in a quart of vinegar, and gave half an ounce of this solution twice or thrice daily, and bathed the local sores with it as often. He states, that "some patients cannot bear the solution without the addition of water, whilst others, without the least inconvenience, bear it undiluted. The discharges by stool, or the presence of gripes or nausea, guide me with respect to increasing or diminishing the dose; but, at the same time, it is not a slight degree of nausea, colic, or diarrhœa that renders an alteration in the quantity of the medicine necessary. To a great number of scorbutic patients, eight ounces of this strong solution, containing one ounce of nitre, have, in the course of the day, as long as such a quantity was necessary, been administered to each with the greatest success. Also, large and frequently-repeated doses of this medicine have been given in cases of scorbutic dysentery, and instead of increasing, I have always found it remove the disease."

75. Mr. Cameron, another experienced naval surgeon, states, that having on several occasions observed the excellent effects of a solution of nitre, as recommended by Mr. Patterson, in scurvy, he was induced to employ it when the disease broke out among the prisoners on board of a convict-ship proceeding to Sydney in December, 1829, under his care. As soon as he commenced the use of this solution, many almost hopeless cases began to improve rapidly, and before one third of the voyage was accomplished, the health of the sick improved so fast under the new treatment, that he did not think it necessary to go into any port; and the general health of the prisoners (216.), when they arrived at Sydney, was much better than when they embarked in Ireland. Some of the cases manifested a severe pulmonary complication, but these also recovered. Mr. Cameron's preparation consisted of eight ounces of nitre, dissolved in sixty ounces of vinegar. Sometimes equal parts of vinegar and lime-juice were used: a little sugar was generally added, to render it more palatable, and a few drops of oil of peppermint, and a little alcohol. An ounce of this solution was a dose; and from three to eight doses, according to the stage and severity of the disease, were given at equal intervals, from six in the morning until eight at night.

76. It has been contended by Dr. Stephens, that the state of the blood in scurvy indicates the exhibition of the non-purgative salts, and not of acids. His own experience appears not to have furnished him with sufficient evidence in this matter. But I may mention, that in states of disease closely allied to scurvy, I have given, from an early period of my practice, the *chlorate of potash*, as well as the *carbonates of soda* and *potash*, with very marked benefit. In obstinate or complicated cases, or when the above means fail, a combination of these salts — of the nitrate and chlorate of potash, and the carbonate of soda or potash—may be tried; or the *chlorinated solutions of lime* or *of soda*. When diarrhœa is present, *lime-water* with milk, or small and frequent doses of the *chloride of lime*, or of *creasote*, in any demulcent vehicle, may be of use; and when hæmorrhages are present, small or moderate doses of the *terebinthinates*, or of the *spirits of turpentine*[*] (§§ 69, 60.), should be exhibited in any suitable form, or on the surface of spruce beer, when that beverage can be procured.

77. When the disease is *complicated* with *pleurisy*, or with *congestive pneumonia*, the nitre, with lime-juice and camphor, will be found beneficial; and epithems or embrocations applied to the chest or over the seat of pain, consisting of the compound camphor and turpentine liniments, will prove of essential service. When the disease is associated with disease of the *spleen*, as often occurs when it follows *intermittent* or *remittent fevers*, the preparations of cinchona or quinine, of serpentaria, guaiacum, &c., have frequently been found of service. In these, as well as in complications with *ague*, the remedies just mentioned should be exhibited in decided or sufficient doses; or various chalybeate preparations may be substituted, or given as circumstances may suggest. If the functions of the *liver* be torpid, or if congestions of this organ or of the spleen be indicated, the *nitro-hydrochloric acids* may be taken in weak solution, as the common drink, and the surface of the trunk, or the lower extremities sponged or bathed with the tepid or warm solution of these acids. In many circumstances of the disease, the compound decoction of *sarsaparilla*, or other preparations of this medicine, will be taken with advantage; and several of the substances mentioned above (§ 68. *et seq.*) will be beneficially conjoined with others, according as circumstances arise.

78. During the course of scurvy, whether simple or complicated, the *bowels* are often more or less disordered. When *costiveness* occurs, it should be removed by the less irritating but efficient means. The most appropriate, and the most successful, is a solution either of the *citrate of magnesia*, or of the *phosphate of soda*; or a sufficient quantity of *magnesia*, taken shortly before exhibiting the lemon-juice or the solution of citric acid. In order to keep the bowels sufficiently open, and to procure a return of the functions of the skin, magnesia may be taken conjoined with the precipitated *sulphur* and a little powdered ginger, in repeated doses. If *diarrhœa* or *dysentery* supervene, the means already mentioned, or those advised in another place (see Dysentery, Scorbutic), should be employed. If the evacuations be very offensive, as well as frequent, lime-water with milk, or the chloride of lime, or powdered charcoal, or tar-water, or creasote, will be found very beneficial; and to either of these, the calumus aromaticus, or other similar substances, may be added. M. Brachet states, that he has cured several cases of scurvy with powdered carbon alone.

79. As the disease approaches to, or assumes the characters of *putro-adynamic* or *maculated fever*, as observed sometimes under circumstances favouring this occurrence, the remedies advised above (§ 68.) for the complication of the distemper with ague; and various antiseptics, especially those recommended for the treatment of putro-adynamic or typhoid fevers (see Fevers, § 585. *et seq.*), should be prescribed with due decision, and appropriately to the features of individual cases. In all the states or complications of scurvy, as in low states of fever, approaching in character to those of scurvy, an *expectant practice* is not only a most dangerous, but a fatal one. The medical journals of the day — the middle of the 19th century — teem with the histories of cases of low fever, in which the practice was either expectant or inappropriate, as far as the treatment is recorded; the *post-mortem* changes revealing the results, which, by the experienced and observing physician, may have generally been anticipated.

80. The *diet* and *regimen* during the course of the malady, constitute the chief part of the treatment, and, as such, have been sufficiently noticed, in respect both of the prevention and cure of the malady. A warm, dry, and pure air (avoiding exposure to cold and wet) and moderate mental excitement, amusement, &c., will contribute very remarkably to the removal, as well as to prevention of scurvy.

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[*] Very recently the spirits of turpentine has been recommended for hæmorrhages, as a new medicine for this class of diseases. I may mention, that, in a memoir, with experiments on the use of this remedy in disease, published by me in 1821, in the *London Medical and Physical Journal*, it was strongly advised to be prescribed for all hæmorrhagic affections; and the same advice has been given for these affections, as well as for numerous others, in this work.

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SEROUS and SYNOVIAL MEMBRANES.

Synon. — *Membranes séreuses*, Fr.: — *Seröse Haüte, S. Ueberzüge, Wasser-haüte*, Germ.; — *Membranes Synoviales*, Fr.; — *Synovial-kapseln, Synovial-haüte*, Germ.

Classif. — See *art.* Peritoneum, Pleura, &c.

1. The *pathology* and *diseases* of *Serous* and *Synovial membranes* have been so fully considered in the *articles* Peritoneum, Pleura, Brain, Membranes of, that a description of the *organic changes* presented by these membranes would be only a repetition of what has been already stated under these heads. As respects these changes, whether those consequent upon the several states of inflammation, or those arising from constitutional causes, or vice, and altogether independent of inflammation, I believe that they will be found to be more fully described, at the places now referred to, than anywhere else. Since these articles were written, the very excellent works of Rokitansky, and the able treatise of Dr. Brinton on the pathology of serous and synovial membranes have appeared; but after attentively perusing these, I find nothing that requires to be added, at this place, by way of appendix to the articles just enumerated. Indeed, there is one lesion, or rather ultimate change, consequent, in rare instances, upon *chronic peritonitis* and *chronic pleuritis*, lately seen by me in these maladies, which is not noticed by either of these writers, namely, the complete degeneration of the greater part of he organised exudation, false membranes, or adhesions produced by these diseases, as well as by chronic inflammation of the serous membrane of the spinal marrow, into fat. This ultimate change, observed by me in these three situations, in old, or very chronic cases of these maladies, appeared to be not merely a far-advanced change, but also a reparative one, admitting of a partial return of the functions of the parts adjoining (see *art.* Pleura, § 100.).

2. The contractions also produced in cases of chronic inflammation of the peritoneum, described by Dr. Hodgkin and myself, have also not been mentioned by these writers. (See *art.* Peritoneum, § 116.)

3. It is almost unnecessary to state, that the organic changes met with in the membranes usually denominated *serous*, occur also in those commonly termed *synovial*, their intimate structures being alike, although their connections are different.

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SHOCK, VITAL or NERVOUS.

Synon. — *Sudden sinking of Vitality*; — *Vital Depression*; — *Nervous Shock*, — *Nervous Depression*, — *Fatal Sinking*, *&c.*

Classif. — I. Class. I. Order (*Author*).

Definit. — *Sudden or instantaneous depression of organic nervous, or vital power, often with more or less perturbation of body and mind, passing either into reaction, or into fatal sinking, occasioned by the nature, severity, or extent of injury, or by an overwhelming moral calamity.*

1. A *shock*, whether physical or moral, may present any grade of severity, from merely a slight but sudden depression of the vital functions, to the rapid extinction of these functions. From its slighter forms, the powers of life react sooner or later, especially when judiciously aided; but its more intense states are either removed with great difficulty, or they proceed, with various rates of celerity, to a fatal issue; the vital sinking increasing more or less rapidly, and extending from the organs more strictly vital to all other parts,— from the seat of injury to the solar ganglion, and thence to the heart, respiratory apparatus, brain, spinal chord, muscles, and senses,—until the functions of all are extinguished. *Vital shock* varies, not only in severity and fatal tendency, but also somewhat in its phenomena, according to the constitution and vital energies of the sufferer, and the nature of the cause.

2. Although the effects of shock have been recognised by most observing persons, even by the uneducated, yet they have received extremely little attention from medical men; they have not been noticed, either in medical or in surgical writings, excepting very casually in some surgical works; and I believe that they are now treated of for the first time in a systematic medical work.* It is necessary to distinguish *shock* from *concussion*; for although concussion, whether of the head or of the spine, is generally attended with more or less of vital shock, still concussion concerns chiefly the functions of either the brain, or spinal chord, or of both, according as the injury is directed to either or both of these quarters. The severity and danger of shock depends, not upon the amount of pain produced, but rather upon the suddenness and violence of the injury, relatively to the amount of vital resistance; for when a cannon-ball, or any other ball, carries off a limb, or does other fatal injury, pain is not produced, but the vital shock is extreme, the general depression,

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* The diseases of the Cæcum and its *Appendix* were fully described, and their treatment pointed out in this work, long before they received any adequate attention elsewhere. Some years afterwards papers were published on that subject in the Transactions of the Medical and Chirurgical Society; and the learned author of these papers commenced with the veracious statement, that the subject had never engaged the attention of any previous writer, although the comprehensive article on the subject in this work is sufficiently extensive to make a small volume, and it was then in the hands of many thousand readers. It is to be hoped, that the present article may receive attention, but not quite similar attention, especially from Surgical readers, whom it more especially interests. "*Sic vos non vobis*," &c.

or vital sinking, often passing rapidly to dissolution.

3. Pain of itself rarely occasions, although it may accompany shock, and, when it does, it generally tends to diminish shock, and to develope reaction. Pain and shock are often associated in injuries and surgical operations; but the former is an endowment tending to the protection of life, to the counteraction of the effects of shock, and to the development of a salutary vital reaction. The severest or most prolonged pain does not occasion vital shock, but it causes vital exhaustion, sometimes even sleep. This was proved by the tortures of the rack in former times, and by the history of the most painful affections. When pain attends severe injuries and operations, the patient sinking more or less speedily, the result should be imputed to the influence of the shock on the constitution, and not to the pain, which is merely unavailing in counteracting the fatal result. This view of the subject, I am aware, is very different from what is generally taken; but a more intimate consideration of the phenomena, than has hitherto been entertained, will show its truth. The importance of this topic is remarkably heightened at the present day by the circumstance of anæsthetics being so generally employed during operations, and even during parturition; for if the view I now take be just, the shock to the constitution, or vital influence, by severe operations, or by a severe labour, will be increased by annihilating the preservative influence of pain; and the immediate, as well as the more remote effects of shock will be thereby more or less increased.

4. In the article, Poisons, I have shown the effects produced by the *inhalation of chloroform and æther* (§§ 615, 616.). It may be useful to view these effects in connection with those produced by dangerous or fatal injuries, and to contrast them as far as they admit of contrast. It will be seen, by observing the progressive effects of chloroform, that it paralyses sensibility, and subsequently, as its influence extends to the medulla oblongata, it more or less paralyses the respiratory functions, and ultimately the heart itself, if its inhalation be continued sufficiently long to produce this effect; the functions of the brain, of the medula oblongata, and of the ganglial system, being successively extinguished. The effects of fatal shock are similar as respects the sinking and extinction of the functions of these several organs, but they present a different order of procession, as will be more fully shown hereafter, the ganglial and cerebro-spinal functions being successively affected. Now, as the effects produced by the inhalation of chloroform are depressing as well as anæsthetic, and as shock is also depressing, although in a somewhat different manner, must it not be reasonable to infer, that the shock will be more severe and dangerous, cæteris paribus, during the influence or effects of chloroform, than when the frame is unaffected by this agent, and when pain exerts its influence, and developes a salutary vital resistance? In this matter, the ascertainment of truth is my object. I reason from my own observation, as far as it has extended, and I leave this part of my subject to those who have had, or may have, a more extensive experience of the phenomena to which these remarks apply.

5. Shock produces effects of various grades of severity, according to the health, or the states of depression or of excitement, the individual may be in at the time of sustaining it. Thus a person of a powerful constitution is much less affected by it than a delicate, nervous, or melancholic individual. A state of excitement, anger, passion, &c., to a certain extent, counteracts its effects, whilst fear, grief, or any of the depressing passions, increase its effects. Even pre-existing disorder, or structural change, renders these effects more dangerous or severe, especially organic change of the structure, or of the cavities or valves, of the heart. These are important circumstances as respects persons for whom severe operations may be required, and should be kept in recollection when such operations are about to be determined on. Whilst the *severity* of shock is thus influenced by constitution, temperament, states of mind, and existing disorder or actual organic disease, the *phenomena* constituting shock are also modified, by these circumstances, in a more or less remarkable manner. The intensity, as well as the modifications of the phenomena of shock, is very remarkably influenced, or even in great measure occasioned, by the state or amount of alarm produced in the mind of the sufferer by the injury causing the shock; this is the more remarkable in severe wounds and other injuries.

6. From these considerations, it will be readily inferred, that the *symptoms* or *phenomena of shock* will vary more or less in different cases, according as one or several of these modifying causes are in operation; and that, whilst certain of them may be wanting in some instances, the whole may be differently grouped, or may appear in varied succession, in most cases.

7. I. Phenomena of Shock. — The *symptoms* of shock vary with the severity or intensity, and nature of the *cause*, and the state or constitution of the recipient. — The *causes* of shock are chiefly, 1st, contusions, bruises, blows, and concussions; and these vary in their effects, according to their situation upon or near vital or important organs, as when they are seated over or near the epigastrium, the cranium or neck, the joints, the spine, &c. 2d. Gun-shot wounds, by which large nerves, blood-vessels, or important viscera, or joints, or large bones, are more or less injured. 3d. Penetrating or incised wounds, or surgical operations, implicating these or other parts. 4th. Simple or compound fractures, dislocations, lacerations, or lacerated injuries of all kinds; and 5th. Mental alarm or terror, or shocks from the sudden or unexpected intelligence of losses of near relations, of friends, of wealth, of honour, or of worldly consideration, or intense fear or dread of some calamity. In many of the preceding classes of causes of shock, mental alarm or dread — the mental shock — greatly increases the effects of the physical shock upon the vitality of the frame, and especially on the manifestations of life in the nervous system; so that in estimating the amount of the latter, care should be taken not to overlook the existence and intensity of the former — of the mental alarm or shock.

8. Now, although these several classes of injury, with their frequent attendant, mental alarm or shock, may be supposed to produce varied effects, yet such is not always the case; for so much may be owing to the severity, as well as the nature of the cause, relatively to the state and constitu-

tion of the sufferer, that the phenomena consequent upon the one class may hardly vary from those following the others. So much, however, is often observed to depend upon the viscera and parts injured, and upon the loss of blood, and the amount of that loss, as well as upon the intensity of mental alarm, as to render it necessary to connect the shock, and its intensity, with the nature and severity of the cause, or causes, which produced it. For, according to the cause, (1st) the shock may be altogether and simply a vital one, as when it is produced by a violent blow on the epigastrium, occasioning concussion of the solar ganglion; (2nd) or it may be associated with various nervous phenomena, as when a large nerve, or joint, or limb, is lacerated or severely injured, and the patient thereby greatly alarmed; (3rd) or it may be complicated with, or rather characterised by, comatose sinking, as when the contusion, concussion, or blow, affects the intimate organization and circulation of the brain; (4th) or it may be so associated with the sinking consequent upon losses of blood, as not to be distinguished from this cause, especially when the injury is such as occasions both shock and hæmorrhage; or (5th) the alarm or shock may be entirely a mental one, or that consisting entirely of the sudden effects of extremely depressing emotions on the action of the heart, or of the sudden and unexpected intelligence of distressing losses or events, whereby the nervous system is more or less shocked, the mental manifestations disturbed, and the functions of the heart and vital organs depressed and otherwise disordered.

9. It will thus be perceived, that the injuries or *causes* occasioning shock may be divided into *five classes*, and that the effects they produce may present *five modified forms*; but although either of these may result from either class of causes, and although it is necessary to connect, our observation of the phenomena, and our treatment of shock, with the particular cause of it, it is still more important, especially as regards the treatment, to mark the particular form and modification requiring our aid.

10. (*a*.) The *simple* or more *vital states* of shock may be so slight as to pass off in a few hours, or so severe as to terminate fatally in a few minutes, according to the intensity of the cause. This effect may be altogether independent of any hæmorrhage, and may result from a variety of causes. A violent blow or contusion over or near the epigastric centre, may so paralyze the heart, as to produce more or less sinking, not only of the action of this organ, but of all the vital functions; the *symptoms* being chiefly feebleness, slowness, or irregularity of the pulse; coldness and pallor of the face, general surface, and extremities; a distressing feeling of sinking and anxiety; slow or irregular respiration; sometimes cold perspiration, with general tremor; and a sunken or collapsed state of the countenance, terminating, more or less rapidly, in loss of pulse at the extremities and in the carotids, and in extinction of sensation, of the heart's action, and of respiration. In some cases, especially when the injury is less intense, or when a large joint is very severely injured, or crushed, these symptoms may not be so intense, may be of longer duration, and be attended by others, as vomiting, singultus, or by restlessness, by feelings of alarm and anxiety at the epigastrium; and, according to the nature and severity of the cause, relatively to the state of the sufferer, these symptoms may lapse into fatal sinking, or be followed by imperfect efforts at reaction, or by delirium, or by reaction, terminating ultimately either in coma and death or in recovery, according to the constitution of the patient, and the treatment adopted.

11. (*b*.) With more or less of the above symptoms, others may supervene, or may be present from the first, more especially when a limb is carried away by a cannon-ball, or when it is lacerated extensively, or near to the trunk of the body, or when large blood-vessels or nerves are lacerated, or large joints are crushed. In these circumstances, as well as in others, especially in nervous and irritable temperaments, various *nervous symptoms*, especially mental alarm and restlessness; irregularity of the heart's action and of respiration; a terrified, as well as a sunk state of the countenance; delirium, terror, and incoherence; a general tremor and coldness; a remarkable and peculiar tremor or quivering of the injured limb, with a cold, wet, pallid, or leaden state of the surface of the limb, or parts adjoining, are more or less remarkable, and seldom terminate in a salutary reaction, unless in a few cases, which admit of surgical interference by amputation, &c. When severe injuries are inflicted upon any part of the abdominal cavity, a state of stupor or apathy, yellowness of the surface of the body, collapsed features, and fatal sinking, as already described (§ 10.), either appear from the first, or supervene upon the symptoms just enumerated. In most of these severe injuries, and especially those produced by fire-arms, the amount of pain is very small compared with the intensity of the shock; and even where the shock is the greatest, the pain may be the least, or may even be entirely absent. Indeed, in many cases, the pain precedes the occurrence of reaction, and even favours the development of this salutary effort of nature.

12. Although surgeons have neglected to treat specifically of *shock*, — a state which particularly concerns them, as respects both the period and the prudence of operating, and the effects of operations, — the subject has been briefly adverted to by many, and especially by LARREY, GUTHRIE, COPLAND HUTCHISON, DUPUYTREN, and HENNEN. It falls not within the scope of this work, to notice the remarks they have offered respecting it; but what they have advanced — which is extremely little — will be readily found in the works of these celebrated surgeons.

13. (*c*.) Injuries may be received directly or indirectly by the brain or spinal marrow, so as to produce a form of shock, which has been generally termed *concussion of the brain*, or of the *spinal chord*, as either may be affected. In such cases, with more or less shock to vitality, or to the frame, there is a special shock sustained by these nervous centres, the minute or ultimate organization and circulation of these parts being so changed or affected, as to instantly arrest all the functions they perform. With the phenomena of shock, as manifested in its more simple form (§ 10.), unconscious fæcal and urinary evacuations, sometimes with vomitings, are also present. When the injury thus implicates the brain, or upper portion of the spinal chord, the annihilation of the functions of

those parts especially distinguishes the case, although the marked and often rapid sinking of the heart's action, or the paralysis of the respiratory muscles, further characterises it, either of these being the more immediate cause of dissolution.

14. (*d.*) Cases often occur in which the shock is heightened by, or complicated with, either *internal*, or *concealed*, or *open hæmorrhage*. In these, the symptoms of simple shock (§ 10.) are more or less manifest, with great pallor of the surface, often with coldness and tremor, sometimes with succussions, or shudderings, or vomitings, passing into deliquium, or fatal sinking, especially when attempting to sit up. The action of the heart then ceases, and with it respiration; the cerebral functions either being but slightly disturbed, unless shortly before death, or ceasing in a way not to be distinguished from the accession of sleep, excepting in the rapid failure of the pulse and respiration. In the less severe cases of this kind, reaction may supervene, and recovery take place, when the nature of the injury causing the shock and hæmorrhage, and the consequences of both, admit of this issue.

15. (*e.*) The *fifth form* of shock depends more or less on mental causes of an intensely depressing nature. The physical effect may be entirely owing to the mental cause, or partly owing to this cause, or to alarm or dread of dissolution in connection with a physical cause, as in cases of gun-shot or other wounds, severe injuries, operations, &c. In these latter cases, the causes are both physical and mental; and the phenomena present a mixed character, more or less of mental alarm or of nervous phenomena, such as are above noticed (§ 11.) being associated with physical depression, — the symptoms of either the *first* or the *second* of these forms predominating with fright, anxiety, or most manifest alarm and distress, or of absolute terror, or even delirium, sometimes, in females, with hysterical convulsions, prolonged faintness or catalepsy. In this form of shock, the strength of mind, the nervous energy, or force of character of the sufferer, modifies remarkably the amount or intensity, as well as the particular form or state, of the physical effect; for the same intensity of cause, which might make but slight impression on a person thus mentally constituted, or on one physically robust, might produce a very dangerous effect on a delicate, nervous, and susceptible individual; this effect being, moreover, often attended by faintness, convulsions, incoherence, &c. Mental shock is more especially depressing and dangerous to persons who are the subject of organic diseases of the heart, or brain — of the former particularly — death often immediately following it.

16. II. The Diagnosis and Prognosis of Shock require but little remark. — *A.* Of the *former*, it may be observed, that it is often difficult to determine whether or no a fatal result be owing to the immediate physical shock and mental alarm which an injury or operation produces, or to the consecutive effects on the frame, either by interrupting some important or vital function, or by contaminating the blood. True or simple shock is always instantly manifested on the cause producing it; it is generally attended by nearly all the symptoms already enumerated, by more or less mental alarm, and by a sensation of sinking and anxiety referred to the epigastrium and præcordia, sometimes with vomitings, characterised by slight, or even no effort, or with unconscious or involuntary evacuations, and an universal failure of all the vital functions. In some of the most severe cases of physical shock, instead of mental alarm, there is either delirium, or stupor, or apathy.

17. *B.* The *Prognosis* depends entirely upon the nature of the cause or injury, and the intensity of the effect indicated by the symptoms. Great slowness, or weakness of the pulse; or great frequency with feebleness, or irregularity; marked coldness, pallor or leaden hue of the surface; tremor, cold perspirations, vomitings, singultus; irregularity of the respiration; continual restlessness; a sensation of sinking or of impending dissolution; delirium, apathy, or stupor; involuntary evacuations; a jaundiced appearance of the surface; rapid failure of the pulse, &c., are all very dangerous, and often fatal symptoms. When the phenomena are less severe, and when the means employed are successful in bringing about a salutary reaction, or even in diminishing the severity of those now mentioned, then hopes of recovery may be entertained. But so much depends upon the nature and peculiarities of the case, upon the patient's feelings and opinions as to the issue, which should always be duly considered, and upon the progress and contingencies of the after-treatment, especially for complicated injuries, as hardly to admit of definite laws of prognosis being assigned.

18. Many of the injuries which occasion severe shock, involve the questions, 1st, as to the propriety of amputating a limb, or shattered or torn stump; and, 2nd, as to the period at which this operation should be performed. The first of these questions has been satisfactorily considered by surgical writers; but the second has been long a subject of discussion, many writers of experience taking different views of the matter. The differences of opinion, as well as of success, as regards the period, after these injuries, at which the operation should be performed, have arisen from the want of due attention to the existence or non-existence of the more marked phenomena of shock at the time of performing the operation, and from recourse having been too frequently had to it before these phenomena had subsided, or before the frame had recovered itself, either partially or more fully, from the shock it had experienced — before vital reaction had commenced; for, if a few hours be not allowed for this purpose, before the operation be attempted, the performance of it so rapidly upon the receipt of the injury may convert a state of shock, admitting of vital reaction, into a state of fatal sinking; or, if the vital energies continue to sink more and more, during the few hours thus allowed for them to rally, notwithstanding a recourse to rational means to this end, an operation will only add to the patient's suffering and accelerate the fatal issue.

19. III. Treatment of Shock. — *The treatment of the more simple states* of physical shock (§ 10.) should be appropriate to the intensity or apparent danger of the symptoms. In the *slighter forms*, warm diluents, the application of external warmth, the allaying of mental alarm, a cheerful confidence evinced by the attendants, and a moderate recourse to gentle stimuli or restoratives, such as camphor, ammonia, æther, &c., in small doses, are generally all that may be re-

quired. But, in *severer* or *dangerous cases*, a more assiduous and a more liberal recourse to these means is absolutely necessary, and should be continued until indications of commencing reaction appear. In these, as well as in others of more imminent danger, even an assiduous and a decided use of these means may be insufficient to bring about the desired effect; and others must be brought to their aid. In these cases, more especially, the existence of mental alarm should be taken into account, and where it is inferred, — for it may exist without being made apparent, — the patient should be assured and encouraged. In all cases of a severe and dangerous nature, and where the occasion admits of having recourse to the means, the patient should be placed in a bed previously well warmed, and two young persons, according to the sex which may be proper, ought to be placed close to him, one on each side, without any intervening covering; and warmth should be promoted by sufficient bed-clothes. In some countries, it has been customary to apply animal heat in a different way, namely, by the skins of animals, torn from their bodies instantly on their being killed, and the internal surfaces applied directly to the patient's body, or even the opened bodies of the animals themselves, whilst still warm. I have seen these means employed, and certainly with greater success than I expected. In cases of shock from blows or contusions on the abdomen, or near the epigastrium, these means are appropriate, and their success admits of rational explanation.

20. In some cases, a stimulating or medicated warm-bath may be tried, salt, mustard, &c., having been added to the water. I do not, however, consider these as efficacious as animal warmth applied in either of the ways just mentioned; and I have generally preferred to warm baths, as being more efficacious, more immediate, and attended with less trouble and fatigue, or exertion, on the part of the patient, the application of flannels, wrung as dry as possible out of very warm water, then freely sprinkled with spirits of turpentine, and instantly applied over the epigastrium and whole abdomen, evaporation from them being prevented by dry cloths or oil-skin placed over them. These hot epithems should be continued or renewed until reaction commences, when they, as well as the internal means had recourse to, ought to be discontinued, and the case subsequently treated according to its peculiar requirements.

21. In those cases which present, from the nature of the injury, more or less of the nervous symptoms above noticed (§ 11.), various nervine remedies, in addition to those already mentioned, may be employed. In these more especially, and sometimes in others, opium, in certain states of combination particularly, is often of service. In conjunction with camphor, or with ether, or with ammonia and aromatics, it is a most valuable remedy. When delirium is present, camphor is required in full doses; whilst the addition of opium, or of morphia, soothes the irritability, and allays the restlessness sometimes present, and diminishes the mental alarm. But when delirium occurs, its passage into coma should be dreaded, and opium and other narcotics should be used with caution, and only in combination with camphor and other restoratives and anti-spasmodics.

22. When the hæmorrhage caused by injuries is so great as to increase the vital sinking attendant on shock, and especially when it increases the alarm of the patient, means appropriate to the circumstances of the case should be taken to arrest it. Prolonged faintness, coldness of the surface, and slowness or irregularity of the pulse, require a decided use of the means already mentioned (§ 19. *et seq.*), aided by the exhibition of ammonia, wine, warm, strong coffee, the horizontal position, and the external application of warmth, as already advised (§ 20.). If vomitings accompany this or other states of shock, the hot epithems prescribed above should be assiduously employed; and especially if convulsions or spasms of any part be complained of. Effervescing draughts, with the ammonia in excess, with opium, camphor, ether, &c., may also be given, or pills containing creasote, opium, and aromatics.

23. The terror and mental alarm often increasing the physical shock in most cases of severe injury, should be combated by the confidence and encouragement of the medical attendants, by a recourse to opium, ammonia, ether, mulled wine, &c. The states of mental shock produced by sudden and alarming moral causes, may occasion so severe physical effects, as to require similar means to those already advised. Faintness, more or less prolonged or repeated, or hysterical convulsions, or spasms, or delirium, may complicate the physical depression, and require the exhibition of diffusive stimulants, conjoined with anti-spasmodics and anodynes. In cases of general shock, from concussion of the brain or spine, the internal use of stimuli may not be required, and it should at all times be administered with caution. The turpentine epithem (§ 20.) may, however, be applied along the spine, when it is the special seat of shock, or even around the cranium, when the concussion implicates the brain, and an enema may be administered containing assafœtida, with a moderate quantity of camphor. But a recourse to these, or other means, should depend much upon the states of the pulse, and of the sensorium, at the time.

24. The external or local means must be left to the judgment of the medical attendant. Cold applications ought not to be made to the seat of injury, as long as coldness of the surface, collapse of the features, and failure of the pulse exist. They will not only aggravate these symptoms, but also increase the anxiety, sinking, and pain at the epigastrium, and the general restlessness and distress. Warm fomentations, with a decoction of poppy-heads, especially if much pain be experienced, or warm embrocations containing some preparation of opium, will generally afford some relief.

25. The injury, especially those produced by gun-shots, severe compound fractures, lacerations, &c., may require the removal of the limb. In this case, if the phenomena of shock produced by the injury be severe, this operation should not be performed until the constitution shows indications of rallying, either by the efforts of nature, — owing to the vital resistance in less severe cases, — or by the means above recommended. A few hours should be allowed for this purpose, — often not more than two or three, — seldom more than eight or ten hours; for if, at the termination of this longer time, reaction has not commenced, and

more especially if the vital depression has increased, the additional shock produced by the operation may rapidly terminate life. It will be better, therefore, to persevere somewhat longer in the use of the means advised for rallying the powers of life, and to increase the doses of these means, always with due reference to the previous habits of the patient, than to attempt an operation which will be of no avail.

26. As soon as indications of *vital restoration*, or of *vascular reaction* appear, the means resorted to for attaining this end should be relinquished; and gentle diaphoretics be given with the view of equalising the circulation and removing internal congestions, which are apt to occur during the vital depression caused by the shock. If the reaction be such as is attedned by heat and dryness of skin, full or strong pulse, thirst, &c., cooling diaphoretics, purgatives, and even blood-letting, especially if the previous loss of blood has been inconsiderable, should be prescribed; and these should be aided by such local means, in cases of severe injury, as their nature may require.

27. The reaction following mental shocks, especially in nervous, susceptible, and delicate persons, and females, is apt to be followed by *delirium* or *fever*, sometimes by *phrenitis* and inflammation of the brain or its membranes, on either of which *coma* is liable to supervene, and similar consequences may follow concussions of the brain or spinal marrow; in such circumstances, the treatment recommended for these diseases, under their respective heads, should be adopted. (*See arts.* Brain and its Membranes, Inflammations of; also Delirium, Coma, &c.)

28. In some instances, instead of either a salutary reaction or increased or inflammatory action of the nervous centres, or their membranes, the shock, whether mental or physical, degenerates into a low, incoherent, or muttering *delirium*, passing more or less rapidly into *coma* (§ 27.). In these circumstances, recovery rarely takes place; but, nevertheless, a strenuous recourse to the restorative means already mentioned, such as frequent doses of camphor, or ammonia, terebinthinate epithems on the scalp and epigastrium, stimulating enemata, &c., should not be neglected. (*See arts.* Delirium and Coma.)

Bibliog. and Refer.— I am not acquainted with any work or treatise on vital or nervous Shock, and but few writers notice it incidentally, far less describe it, or advise a treatment suitable to its several states. I have treated of Shock in this work, because I consider it a most important and dangerous affection implicating more or less the whole vital and animal functions, and hence, coming strictly within the province of the physician, as well as within that of the surgeon. When we consider that, of the numerous accidents and wounds which cause death, the greater proportion produce this effect by the severity and suddenness of the shock to the vitality of the frame, rather than by any interruption to the functions of the injured part, the interest of this subject will appear in its true light. The principal works in which it is incidentally mentioned are the following: — *Larrey*, Mém. de Chirurg. Militaire. 4 tomes, 8vo. Paris, 1812—17. — *G. Guthrie*, On Gun-shot Wounds of the Extremities, 3d ed. 8vo. Lond. 1827; and on Wounds and Injuries of the Abdomen and Pelvis, 8vo. Lond. 1847. — *J. Hennen*, Principles of Military Surgery, 2d ed. Edin. 8vo. 1820. — *A. Copland Hutchison*, Practical Observations in Surgery, 8vo. 2d ed. 1826; and Observations on the Period for Amputating in Gun-shot Wounds, 8vo. Lond. 1817. — *Dupuytren*, Leçons Orales de Chirug. Clin. t. ii. art. 7. t. iv. art. 7. et 14. — *S. Cooper*, Surgical Dictionary, 7th ed. 8vo. Lond. 1838, p. 650.

SKIN:—Synon.—*Integuments; Integumental Sac, or envelope of the frame; Cutis, Corium, Derma;* — *die Haut, das Fell*, Germ.; — *Peau*, Fr.

Classif. — General and Special Pathology — Symptomatology.

1. I. Functional Alterations. — The *skin*, or integumental sac or covering of the body, discharges more important functions than have commonly been imputed to it. I long ago, and more recently in various parts of this work, endeavoured to prove, that the skin performs offices of a very high order in the œconomy; that through it, effete and excrementitious matters are carried out of the blood, and that in this respect, as a depurating organ, it aids the functions of the kidneys, of the large bowels, and of the lungs; an impairment of the functions of either of these being often attended by a vicarious increase of its actions. It is thus an eliminating organ, contributing to the depuration of the blood, generally to an extent more or less intimately related to the amount of function performed by the other emunctories. That the skin performs a vital action, consisting of an insensible and a sensible exhalation the amount of either depending much upon the state of the atmosphere, is generally admitted. Increased transpiration may proceed from a variety of causes; and so may diminished transpiration, and either, in its more manifest states, is an important indication of disorder. The insensible perspiration may become sensible, owing only to a mild, warm, or humid state of the air; whilst the perspiration may not only be insensible, but this state of it may be much increased by more or less evaporation of the fluid in the skin by great dryness of the air.

2. *A.* When the halitus, or transpiration of the skin exceeds the evaporation of it in the atmosphere, sweat is formed; but, in addition to the substances contained in the perspiration, carbonic acid is also given out by it. In healthy persons, the skin exhales carbonic acid, nitrogen, and a watery fluid containing small quantities of the following substances: — 1st. Matters soluble in ether: traces of fat, sometimes including butryic acid.—2d. Substances soluble in alcohol: alcoholic extract, free lactic and acetic acids, chloride of sodium, lactates and acetates of potash and soda, lactate or hydrochlorate of ammonia.—3d. Substances soluble in water: watery extract, phosphate of lime, and an alkaline sulphate.—4th. Substances insoluble in water: desquamated epithelium, and phosphate of lime with a little peroxyde of iron.

3. Carbonic acid and nitrogen gases are exhaled in constant, but in varying proportions. Collard de Martigny states, that they are exhaled in the greatest quantities after meals and violent exertion; and that vegetable food causes an excess of carbonic acid, and an animal diet an excess of nitrogen. It may be regarded, with Edwards, that the physical exhalation of the skin is pure water and these gases; and that the organic function of the skin is the elimination of the above substances. (§ 2.) The proportion and amount of these matters vary much in different races of men. From several experiments, made many years ago on the Negro, I found that the gaseous exhalation from the skin, as well as the solid matters contained in the perspiration, especially the former, was much greater in this, than in the white race; and that the function of the skin in the former was

more decidedly supplementary of that of respiration than in the latter. Indeed, the cutaneous function of the negro race is of a much more decidedly eliminating nature, than that of the white race.

4. Besides the perspiration, the skin furnishes, by means of its sebaceous glands or follicles, a substance consisting of stearin, albumen, extractive matter with olein, phosphate of lime, &c.

5. The eliminating function of the skin is suppressed or interrupted in many diseases, especially in inflammations, until suppuration commences, in the early stage of fevers, in scurvy, in diabetes, &c.; whilst it is more or less augmented in the sweating stage of agues, in some adynamic forms of fever, in pestilential cholera, in acute rheumatism, in the advanced stages of tubercular consumption, in internal abscesses, and in other colliquative maladies.

6. *B.* The perspiration may be variously changed in *quality* in several diseases, owing to the contamination of the blood by some specific animal poison, or by the combinations of elements or materials which are usually, in health, eliminated from the blood by the several emunctories, and which, when either of these emunctories become impaired in function, accumulate in the blood, and are evacuated, in different combinations or states, in the cutaneous exhalations. Thus the sweat of rheumatic and gouty persons is generally acid, whilst in putro-adynamic fever, and in scurvy, it has a putrid odour. The perspiration of persons affected with itch, is said to emit a mouldy odour, and that of syphilitic patients has a sweet smell. STARK states, that the sweat of scrofulous persons resembles the odour of sour beer. The perspiration of persons labouring under small-pox or measles, or pestilential cholera, or scarlet fever, is often so peculiar in each of these maladies, as to lead to the recognition of the disease by its scent alone. On entering a house in which cholera was present, I have recognised the malady by the odour of the effluvium from the patient before I have seen him. The sweat is not only abundant, but often presents an urinous odour, in suppressions of urine, or other obstructions of the urinary organs.

7. *The lactic acid*, which is the usual free acid of the perspiration, is generally much increased in acute rheumatism and gout, especially the former. Dr. PROUT found free *acetic acid* in the sweat of a person in hectic fever. STARK says, that lactic acid is increased in the perspiration during scrofula, rickets, and various cutaneous eruptions; and both it and acetic acid exist in the sweat of females during their confinements, and even during suckling. The putrid sweat in adynamic fevers probably contains *ammonia.* The *saline ingredients* of the perspiration may be much increased. Dr. PROUT observed the skin of a man in dropsy covered with a white crust of chloride of sodium after an abundant sweat. In cases of gout, of urinary concretions and urinary obstructions, the quantity of phosphate of lime, and of other salts, is more or less augmented.

8. *C.* The foregoing consists only of an increase of the *normal constituents* of the perspiration; but *abnormal constituents* may be present. ANSELMINO and STARK assert, that *albumen* may exist in the sweat in rheumatic fever, in putrid, gastric, and hectic diseases. *Blood* has been seen in the perspiration in scurvy, and in putrid and yellow fevers. *Uric acid* and *urate of soda* have been found in the sweat of persons suffering from gout and urinary calculi. *Bilin* and *biliphæin* have been found in the perspiration of jaundiced persons, and sometimes in those labouring under low, bilious, remittent fevers. This secretion has, in rare instances, been seen variously coloured, owing to the existence of certain colouring matters, as cyanurin, &c. *Fat* has been found in the sweat in some colliquative maladies.

9. Various *substances, foreign to the œconomy,* may have been taken into the body and appear in the perspiration, especially sulphur, mercury, iodine and its combinations, indigo, saffron, assafœtida, camphor, &c. But as regards these and various other substances which are carried into the circulation, and eliminated from it by the emunctories, it is difficult to determine, unless by well-planned experiments, how much of this elimination is performed by the skin, or by the pulmonary exhalation, or by the kidneys.

10. II. ALTERATIONS OF APPEARANCE AND STRUCTURE.—i. The *temperature* of the skin varies much in disease, and somewhat in different constitutions and temperaments. It is generally *below* the healthy standard in scurvy, in some states of chronic rheumatism, in paralysis especially in anæsthetic paralysis, and in pestilential cholera most remarkably. The temperature is very much *increased* in the early stages of most fevers, especially in those characterised by augmented vascular action, and when transpiration from the skin is much diminished, or altogether suppressed. In these cases, more especially in ardent fever and inflammations, and in some states of malignant fever, the skin is not only hot, but it also conveys the sensation of an acrid or burning heat, even above that which the actual rise of temperature should impart. In all inflammations and acute diseases, the heat of skin is increased, especially when the perspiratory functions are interrupted. The temperature of the skin is also greater than natural, when the blood is loaded with excrementitial elements, owing to diminished elimination by the kidneys, bowels, and skin, and more especially when the accumulation of these elements in the blood is attended by febrile or increased vascular action. It is also sometimes increased shortly before dissolution, probably owing to this state of the blood.

11. ii. *The colour of the skin* is variously changed in disease, and this change may be general, or in large patches, streaks, or in small spots or points. The change may consist either in absence of colour, or uncommon pallor, or in a deepening of the tint. All changes of colour arise from the quantity and quality of the blood circulating in the vessels of the cutis vera; or, in the opinion of ROKITANSKY, from the state of the epidermis, especially its inner, or Malpighian layer, from some change in its cells, or from some unusual pigment in them.

12. *A. Pallor* of the skin is owing either to excessive loss of blood, to exhausting maladies, or to the chronic deficiency of red globules, observed in spontaneous anæmia, and some states of dropsy. The pallor may be associated with a slightly greenish or etiolated hue, as in chlorosis. It arises, in rare instances, from a congenital deficiency of pigment in the dark races, as observed in Albinoes, or from an acquired defect of this

kind. This latter change — achroma — may occur in all races, is generally limited in extent, or consists of a number of spots, of various sizes, that gradually spread.

13. *B. Yellowishness* of the skin is one of the most common alterations of colour. The shade may be very pale or very deep, or the yellow may be mixed with green; and even a dark greenish hue may predominate. These shades of colour occur in the different states of jaundice, and are most frequently owing to biliary obstructions occasioned by disease of the liver, or gall-bladder, or of the gall-ducts. Various tints, varying from yellow to yellowish green, to a yellowish blue, seldom uniform in all places, or continuing of the same depth or shade, are observed in the courses of pestilential yellow fever, or hæmagastric fever, when the blood becomes much altered, and resemble the discolourations caused by contusions. This change occurs in large blotches, patches, streaks, &c., and is not limited to any one part of the body.

14. *C.* A *dark, sallow,* or *muddied aspect* of the skin is observed at an early stage of typhoid or adynamic fevers, and this appearance often increases as the disease advances. It is owing chiefly to the state of the blood produced by defective oxyganization, or by imperfect depuration by the emunctories. A hue resembling this, but deeper, or inclining to brown, or to brownish yellow, seems to be owing to the deposit in the epidermis of a pigment. It occurs most frequently in spots or in patches or streaks, very rarely over the whole surface. I have observed it in spots and patches in a lady, who many years previously was the subject of jaundice. The uniform embrowning of the skin, by exposure to the sun, the spotted stains or freckles — ephelis, and the liver-spots, connected with disorders of the biliary apparatus, or of the uterine functions, are modifications in the colouring matters retained by the epidermis. ROKITANSKY remarks, that the skin sometimes becomes dark, when, with neglect of it and indulgence in alcohol, are combined infiltration of the liver with fat, and a tallowy state of the sub-cutaneous layer of fat. The skin in this case feels fatty, soft, and velvety, like that of a negro; its colour proceeds from the deposition of a pigment, containing fat, in the deepest layer of the epidermis, — a fact of much interest, owing to the association it evinces.

15. *D. Redness* of the skin occurs in so diversified forms, and with so numerous shades of yellow, blue, brown, livid, copper or bronze colour, &c., as to elude precise description, unless in affections and alterations of which these colours are pathognomonic. Of the several congestions, inflammations, impetiginous, exanthematous, chronic and specific eruptions, these colours are severally characteristic. The redness passes into blue, or bluish yellow, even to black, after exudations of blood into the cutaneous tissue; as in the sugillations, ecchymosis, vibices, petechiæ, &c. of scurvy, purpura, maculated and malignant fevers.

16. *E. Blueness* of the skin is the characteristic of cyanosis, which is more or less general, although somewhat deeper in parts which are delicate and vascular, and in the extremities. When it is limited to particular parts, it is usually the result of congestion, or of cold. A transient blueness of various parts of the surface has been remarked in rare instances by OTTO: but in small patches or spots this discolouration is not infrequent. A *deep leaden*, or bluish tint, attends the collapse of pestilential cholera, but it is deeper on some parts than in others, especially shortly before dissolution. It also appears, in a slighter degree, in the face and extremities, in threatened asphyxia from congestive pneumonia, general bronchitis, hydrothorax, and from congestion of the lungs. A blue tint, approaching to bronze, is sometimes produced in the skin by the protracted use of nitrate of silver, and remains permanent, or nearly so, during life.

17. *F.* A *blackish tint* is sometimes observed in aged cachectic persons, especially in the lower limbs, and extends over large portions of the skin. It has been called melasma, and is different from melanosis. Lighter shades of black, passing into a tawny, dirty grey, leaden hue, &c., are sometimes observed in connection with various acute and chronic diseases, characterised by extreme cachexia and dyscrasis of the blood and soft solids, especially pestilential and malignant maladies, scurvy, cancer, &c.

18. iii. *The texture of the skin* is often remarkably affected; and changes of texture are also attended and followed by alteration of colour.—*A. Anæmia* of the integuments is observed chiefly in universal anæmia, but it may affect the integuments of the extremities only. The skin is always pallid when anæmied; and the pallor presents a waxen hue when the skin is delicate, and the parts beneath are fat or œdematous.

19. *B. Congestion* of the skin is observed after death in the most depending parts. It is seen in some adynamic or malignant diseases, occasioning lividity, dark-redness, or a bluish or blackish tint, and is most manifest in parts most remote from the heart, and when mechanical obstructions of the circulation exist.

20. *C. The exudations of blood,* or small, circumscribed hæmorrhages, into the tissues of the skin, forming small spots or larger patches, or sometimes streaks, observed in purpura, in scurvy, and in petechial fevers, have been ascribed by ROKITANSKY to a higher degree of congestion of the skin; but however greatly these changes may be owing to the cause to which he imputes it solely, they depend more on impaired irritability of the extreme capillaries, on diminished vital cohesion of the tissues composing the skin, and on dyscrasis and other changes in the blood itself. (*See art.* HÆMORRHAGE, §§ 14—19.)

21. *D. Inflammations* very frequently attack one or more of the tissues composing the skin. They are sometimes idiopathic and substantive diseases, especially when produced by external or physical causes; but they are more frequently symptomatic, or caused by morbid conditions of the circulating fluids, arising from a superabundance of excrementitial elements and materials in the blood, or from a specific animal miasm or poison. Most of the chronic eruptions, or inflammations, depend upon morbid states of the blood, caused by impaired depuration by the kidneys, liver large bowels, or by the skin itself. Some of these inflammations may also appear as a morbid reflection on the skin of disordered actions of important internal viscera. Inflammations of the skin are either limited to spots or to patches, more or less numerous, or diffused over large tracts. They sometimes are seated only, or chiefly, in the

external layer and papillæ, as in *erythema;* and at others, the deeper layer, and the whole thickness of the corium, are affected, as in *phlegmonous* inflammation. From these forms, there are numerous transitions and associated changes, according as one or more of the layers or tissues composing the integuments, or as the subjacent cellular tissues, are implicated, and as the disease may extend in spots or patches, or become more or less diffused. Inflammations of the skin, whether erythematous, exanthematous, impetiginous, phlegmonous, furuncular, gangrenous or ulcerative, or acute, chronic or specific, have been so fully described in the numerous articles or heads to which they severally belong, that I cannot devote further space to their special consideration, more particularly as there is nothing of importance which I can add to what has already been advanced respecting them individually.

22. *E. Adventitious growths* in the skin have been described chiefly in respect of their internal characters, and often commence in the subjacent cellular tissue. — *a. Molluscum simplex,* or soft, wartlike growths, attached by a pedicle, consists of saccular dilatations of the corium, and contains cellular tissue, and sometimes also fat. — *b. Fleshy excrescences,* which often form on the nose, are composed of a luxuriant growth, or hypertrophy, of the corium, and of cellular tissue.

23. — *c. Condylomata* commonly form about the organs of generation and the arms, especially in the mucous membrane of the former. They are either soft, or more or less firm; and in their form they are either broad, or rounded, or pointed. They are often attached by a pedicle, their extremities resembling a mulberry, a cauliflower, or a cock's comb. They are composed of an investing layer of epithelium, and of newly-formed cellular tissue. They originate in the corium, where they take deep root. With these, Rokitansky believes, that certain tumours regarded as syphiloid, the Radesyge, &c., may be connected.

24. *d. Fatty tumours* are most frequently congenital, but they are sometimes developed at later periods of life. One only may exist, or there may be several on different parts of the body. They are rounded, often truncated, and attached by a pedicle, and they sometimes reach a very considerable size. They consist of a prolongation of skin, as if protruded by an inclosed lobule of fat, which is continuous, by a sort of pedicle, with the subcutaneous, adipose stratum. The epidermis covering them is sometimes dark-coloured, owing to the pigment it contains, and hair occasionally grows upon them. When congenital, it is often associated with nævus in other parts of the skin.

25. *e. Fibrous tissue* occurs in the skin after repeated or chronic attacks of inflammation, and in the cicatrices after burns and other injuries. The alteration termed *cheloid* by Alibert, is connected with the fibrous; for it appears to consist of a fibrous callus, and with that appearance its external cicatrix-like aspect corresponds. Rokitansky describes this latter alteration, — the cheloid — as consisting of several varieties, — of a simple hardness or callosity of the skin; or of a flat, somewhat raised, or a depressed hardness; or of a cord-like hardness, and of a white, or pale, or rose-colour. In either form, it may terminate in white or red elevated lines or processes. It is of inconsiderable extent, and occurs, for the most part singly, at the upper part of the trunk, on the extremities, or on the face. It rarely exists in large numbers, and it seldom ulcerates; when it does so, it becomes indolent and difficult to heal. It is generally connected with constitutional disorder, but it is not truly cancerous.

26. *f. Bony deposits* are extremely rare in the skin. Rokitansky once found a bony plate, which was oval, yellowish, hard, and rugged, of the size of a half-crown, in the substance of a scar on the trunk. It corresponded precisely with the osseous deposits occurring in fibrous exudations on serous membranes.

27. *g. Vascular nævi—teleangiectasis*—are generally congenital. They sometimes form deep or bluish red stains, of various sizes and shapes; occasionally red tumours, resembling cherries, strawberries, or mulberries, and often present a transient swelling, — *erectile* or *splenoid tumours* of some authors. They also commence, in rare instances, after birth, or at later periods, and are at first, or even subsequently, not malignant; but they may, in the cancerous diathesis, be converted into malignant growths — into a fungus hæmatodes cutis.

28. *h. Melasma,* or the blackish discolourations observed chiefly in aged, decrepit, and cachectic persons, occurs either diffused in parts of the surface of the body, especially the lower extremities, rarely over the whole surface, or concentrated in small raised spots, or berry-like tumours, on the trunk or face. In the former, the colouring matter is diffused on the surface of the cutis; in the latter, in the substance of the cutis also. Melasma should not be confounded with melanosis, the cancer melanodes.

29. *i. Tubercle.*—It is doubtful whether or no true tuberculosis affects the skin in a way corresponding to that observed in mucous, serous, and parenchymatous structures. Tubercles, however, appear in ulcers affecting the cutaneous expansions of scrofulous persons, but most frequently in a softened form, or in that of puriform tubercular matter. An ulcerative softening of the skin, in connection with tubercular deposits in the subcutaneous cellular tissue, or in lymphatic glands, is a common occurrence.

30. *k. Cysts* do not occur in the cutis vera; but the sebaceous glands often degenerate into cysts of considerable size. Cysts also form in the subjacent cellular tissue, and become closely connected with the skin. These, as well as morbidly-enlarged sebaceous follicles, commonly contain cholosterine. This substance has also been met with as a stratum on the surface of open ulcers of the skin.

31. *l. Cancer* and cancerous ulceration are often met with on the skin. When cancer commences in the subcutaneous or glandular tissues, particularly the mammæ and lymphatic glands, it generally soon implicates the skin, and becomes, from an early period, very closely connected with the cutis. But cancer often also originates in the skin, in the form either of fibrous or scirrhous cancer, or of medullary cancer.

32. (*a.*) *Fibrous cancer* of the skin generally assumes the form of a tuberculated or rounded nodule, sometimes flattened, or even depressed, below the surface of the skin, and forming an umbilicated fossa. It is generally single, about

the size of a hempseed, pea, or small nut, firmly fixed, and as hard as cartilage. Sometimes it is smooth and shining externally, occasionally covered by a hard, laminated crust of cuticle, and often darker than the surface around. It occurs chiefly on the face, lips, and nose, but occasionally on other parts of the body. It is commonly the primary cancerous growth, and often the first of a series of cancerous formations in different organs. In some instances it reaches a considerable size, growing into a tuberous mass, projecting beyond the skin. (Rokitansky.)

33. (*b.*) The *medullary kind* is usually a secondary formation, and consequent upon large cancerous growths, which first appear just beneath the skin, or which involve the subcutaneous structure first, and then the skin itself. In either case it grows in the skin in isolated or confluent nodules near the primary mass. It sometimes also appears in the skin, after it has been localised in one or more organs. The nodules which it forms in the cutis are mostly numerous, and about the size of peas or hazel-nuts; they are scattered over the body, especially over the trunk, and generally near similar growths in the subcutaneous cellular tissue. In the case of a boy, about 14 years of age, for whom I was consulted, I counted upwards of twenty thus disseminated. It is characterised as a whitish, or whitish red growth, which is sometimes tolerably firm and lardaceous, or medullary, and occasionally looser, softer, and resembling cerebral substance, or even much softer and diffluent; and it often grows to a considerable size. It may also contain black pigment, and thus constitute *cancer melanodes* of the skin. The layer of skin above the nodule becomes stretched, and shining or transparent, or rough from the loss of its epidermis. Sometimes the elementary particles of the disease are deposited in vascular *nævi*, or, as the deposition takes place, the vessels of the part are excessively developed, and a cancerous structure, of uncommon vascularity, is the result, or *fungus hæmatodes* of the skin. Rokitansky considers *chimney-sweepers' cancer*, and Alibert's *eburnated cancer of the skin*, as special varieties of this disease.

34. *α. Chimney-sweepers' cancer* appears to be medullary. It begins in the scrotum as a tolerably firm, small nodule, or warty excrescence, which after some time becomes red, excoriated, moist, and covered by a cortex of thickened cuticle. The papillæ beneath enlarge, and the whole becomes an ulcer, with irregular, hard, and raised edges. Fresh nodules form around the original one, undergo the same changes, and enlarge the disease superficially. The nodules are developed into fungous cauliflower excrescences, and the disease extends deeply, until the dartos, the tunica vaginalis, and testicle are successively implicated, and the gland itself ulcerates, while the adjoining lymphatic glands and vas deferens degenerate up to the abdominal cavity.

35. *β. Eburnated cutaneous cancer* is a secondary degeneration of the cutis over a subcutaneous scirrhous mass. The skin is white, glistening, indurated, partially transparent, and immoveable, over the firm or hard mass. This change of the skin evidently belongs to the fibrous form of cancer, as it is always connected with the subjacent scirrhus. *Cancerous ulceration* supervenes, at a sooner or later period, upon all the forms of cutaneous cancer, and generally proceeds as I have described when treating of Cancer. (*See that art.* § 11. *et seq.*)

36. *m. Parasites.*—Several kinds of *pediculi* are found on the skin, especially on parts covered by hair; and the *acarus scabiei*, and probably other species of the genus acarus, occur on, and in eruptions of, the skin. Various fungi also exist in certain chronic eruptions on the cutis, as in cases of *tinea favosa*, and *sycosis*. The subcutaneous cellular tissue not infrequently lodges the *filiaria medinensis*, especially in certain climates, as the western coast of Africa, &c.

37. III. The Sebaceous Glands, or follicles, and their ducts, are often the seats of various disorders; and in many of the affections of the skin, and in some of the exanthemata, especially small-pox and measles, they are especially implicated. But they are more manifestly the seat of disorder, when an accumulation of thin secretion takes place in them, owing to an impaired power of discharging it, or of throwing it off, or to obstruction of their ducts. In the former state, or impaired power of excretion, the duct is enlarged, and filled with the accumulated secretion, forming what has been termed *maggots.* In the latter state, the secretion accumulates in the follicular sac itself, and produces a rounded tumour, from the size of a millet-seed to that of a hazel-nut, or even larger. The matter thus accumulated consists of a whitish substance, of a pulpy consistence, viscid like fat, and resembling adipocire. In many cases it is very offensive in its odour, and irritating to the containing tissues, thereby producing inflammation, as in acne, sycosis, &c. Calcareous deposits, and even horny excrescences, may even originate in those glands in very rare instances. The secretions of the sebaceous follicles may be either deficient in quantity, altered in quality, or excessive in amount; and, in either case, occasion a more or less manifest disorder of the functions of the skin. In the *first* of these conditions, the skin will be dry and harsh; in the *second*, the exhalation from it will be more or less offensive; and in the *third*, it will be unctuous, humid, and often also offensive to the smell.

38. IV. The Cuticle and Nails partake in several of the diseases of the skin.—(*a.*) The *cuticle* is sometimes very thin and delicate throughout, owing to original formation, but more frequently only in parts, especially in those where it has been recently thrown off. It is much more frequently formed in excess; and then either its outer layers are separated in the form of bran, scales, scurf, or laminæ, or it accumulates and adheres, producing callosities, corns, or crusts, of various forms and sizes, occasioning more or less uneasiness, or pains of the subjacent parts.

39. *α.* The *colour* of the skin partly resides in the deeper layers of the cuticle, which may contain a yellowish, brownish, or a black pigment, distinguishing, when congenital and general, particular races or individuals. But the colouring may be acquired, and limited to particular spots or parts, or be more or less diffused, and indicate disorders of important internal organs, or a cachectic condition of the whole œconomy. It is always in excess, in a remarkable degree, in congenital nævi. A complete absence of the colouring matter is congenital in albinoismus, and is acquired in achroma or vitiligo. The former may be general

or partial; the latter is always partial at first, but it may become more general.

40. *β*. The epidermis is often drier and harsher than natural, it is rarely more moist. It presents the former states in various cutaneous diseases, in which it is either thrown off in the form of scales, or it accumulates, and occasions cracks or fissures, extending through it into the cutis. Accumulation of the epidermis, or of the cells composing this structure, is often simultaneous with, if not the consequence of, excessive development of the papillæ of the cutis. The morbid results of these conditions are one or other of the following: — 1st. *Callosity*, tyloma, or simple accumulation of epidermoid cells, in the form of strata, successively formed underneath, the more recently produced extruding the older; — 2d. *Corn*, or clavus, a circumscribed callus, projecting into the corium, and occasioning more or less pain; — 3d. *Crusts*, scutes, or scutiform accumulations of laminæ of diseased epidermis, presented by the scaly eruptions; — 4th. *Horny growths* proceed either from a diseased portion of skin, or from a sebaceous follicle; and are met with generally on the scalp, and are usually single, much more rarely two or more are observed. They are of various dimensions, from half an inch to several inches in length, and as thick as, or thicker than, a finger; straight, or curved, or crooked; attached by a broad base, and of a dark colour. They have been observed in some cases to be regularly shed at intervals; and when removed, they are reproduced, if the portion of skin producing them be not destroyed.

41. (*b*.) The *nails* often present the peculiarities possessed by the parents, or evince hereditary characters. Their growth may be excessive or deficient; or they may be misshapen or thick, twisted, or curved. They may be everted or inverted; or become excessive in length, or much shortened. Eversion is often observed in psoriasis, when shortening, thickening, and induration are often co-existent with it. The nails are then discoloured, and are also drier and more brittle than natural. Incurvation of the nails, sometimes with elongation, is common in tubercular consumption. The most deformed states of the nails are observed in connection with the scaly eruptions. (See the articles on these eruptions, and that on the Hair.)

42. V. Classification of the Diseases of, or affecting the Skin. — The arrangement of diseases of the skin must necessarily be conventional. All disorders of the animal œconomy, — whether functional or structural, whether local or constitutional, whether internal or external, — glide insensibly into those more intimately allied to them in situation, in the nature of the tissues affected, in constitutional disturbance, and in the local and general characters of the affection; and present no constant lines of demarcation by which they can be accurately separated from those which they most resemble. Morbid actions, even in their most visible and palpable forms, evince none of the unalterable features characterising the products of the vegetable and animal kingdoms. These products belong to distinct genera and species, and each consists of a specific being; but morbid actions are incalculably diversified, and ever varying, passing insensibly, and more or less rapidly, into as varying states of visible disease, and ultimately into not merely manifest but also palpable organic changes, when the earlier phases or grades of morbid action are not arrested by vital resistance, or by the aid of medicine.

43. Of the more or less *artificial classifications* of diseases of the skin, furnished by Plenck, Willan, Bateman, Plumbe, Rayer, Wilson, and others; or of the *natural arrangements* attempted by Alibert and Paget, most of the former being modifications of the classification of Plenck or Willan, it is unnecessary to take particular notice. An artificial arrangement involves frequent repetitions when treating of this class of diseases, — presents as unvarying distinctions what are continually undergoing changes, and are neither peculiar nor constant, — and insufficiently recognises constitutional disturbances, specific taints, and contaminating causes. Natural classifications, whilst they are based on natural alliances arising out of constitutional conditions, and specific causes or contaminating influences, retain those visible or palpable distinctions which actually exist, and present them for the purposes of diagnosis and of rational treatment. The artificial plan comprises, under the same order, eruptions which require the most opposite indications and means of cure; whilst the natural arrangement associates those maladies in one family or order, for which the same indications and remedies are found most beneficial. Without entirely neglecting the classifications of Alibert and Paget, the following has been devised with a much stricter adhesion to constitutional and natural alliances than these writers have shown, and with a due recognition of the causes, contaminating characters, and ultimate changes, which distinguish these diseases individually, and which connect each group and family with those preceding or following it. The reader will perceive, by comparing the following arrangement with those of the authors above mentioned, in what it differs, as well as in what it agrees with them.

44. Order, Family, or Natural Group I. Dyschromata — *Maculæ*. — Changes of colour, or excess or deficiency of the colouring matter of the skin, occurring congenitally, or at any period of life, generally in spots or large patches, and frequently connected with slight disorder of the digestive organs, or of the general health.

45. Genus i. — Pannus — Ephelis, — *Chloasma*. — Consisting of spots, patches, &c., of various forms, of a darker or deeper hue of the skin, owing to increase of its colouring matter, occurring at any period of life. — *Spec.*: 1st. *P. lenticularis*; — 2d. *P. hepaticus*; — 3d. *P. melaneus*; 4th. *P. carateus*. (*See art.* Ephelis.)

46. Genus ii. — Achroma. — White spots or patches scattered over the skin, or limited to a part, the decolouration being remarkable, and often attended by temporarily impaired sensibility, owing to deficient or interrupted arterial circulation, when the extremities are its seat. — *Spec.*: — 1st. *A. Vitiligo*; — 2d. *A. Congeniale.*

47. Order II. Dermatites — D. simplices — Eczemata — *Eczematosæ*. — Inflammations of the skin, attended by redness, itching, stinging, slight swelling, or an eruption of papulæ, vesicles, bullæ, pustules, or tûbercles; often being of local origin, but much more frequently depending upon disorder of the digestive and eliminating organs, and consecutively of the circulating fluids; and observing either an acute, or sub-acute, or

chronic course. They are not limited to any part of the cutaneous expansions ; they may affect one or more of the cutaneous tissues, or even extend, more or less, to the subjacent cellular substance ; and they are not contagious.

48. Genus i. — Erythema. — Superficial redness, varying in extent, with slight elevation, terminating in furfuration and desquamation, or, in cachectic habits, from neglect of cleanliness, or improper treatment, in excoriation or ulceration. — *Spec.* : 1st. *E. spontaneum* ; — 2d. *E. endemicum* ; — 3d. *E. epidemicum* ; — 4th. *E. Intertrigo* ; — 5th. *E. Paratrimma* ; — 6th. *E. Pernio* ; — 7th. *E. per Adustionem.* (*See art.* Erythema.)

49. Genus ii.—Roseola—*Rose-Rash.*—Rose-coloured, irregular, and slightly elevated patches of the skin, transient and not papular ; passing into deeper roseate hues as they disappear, generally preceded or attended by slight fever, or gastro-intestinal disorder.— *Spec.* : 1st. *R. æstiva* ; — 2d. *R. autumnalis* ; — 3d. *R. annulata* ; — 4th. *R. infantilis* ; — 5th. *R. symptomatica vel associata* — of small-pox, of cow-pox, of fever ; of gout, of the consecutive fever of pestilential cholera. (*See art.* Rose-Rash.)

50. Genus iii. — Urticaria. — An eruption of irregular, prominent patches or wheals, of various sizes, generally transient, and attended by burning, tingling, and itching, and by slight fever and disorder of the digestive functions. — *Spec.* : 1st. *U. febrilis* ; — 2d. *U. evanida* ; — 3d. *U. tuberosa.*

51. Genus iv. Lichen — *Licheniasis.* — An eruption of clustered or irregularly-disseminated papulæ, attended by itching, stinging, &c., and slight febrile disturbance, or gastro-intestinal disorder, terminating in desquamation, and liable to recur. — *Spec.* : 1st. *L. simplex* ; — 2d. *L. Strophulus* ; — 3d. *L. agrius, vel L. tropicus.* (*See art.* Lichen.)

52. Genus v. — Prurigo. — A papular eruption, the papulæ being larger than those of lichen, of nearly the colour of the skin, generally appearing on the outer surface of the limb, attended by burning and intolerable itching, &c. — *Spec.* : 1st. *P. mitis* ; — 2d. *P. formicans* ; — 3d. *P. senilis.* (*See art.* Prurigo.)

53. Genus vi. — Eczema. — An eruption of minute vesicles, crowded together, non-contagious, and terminating by the absorption or evaporation of a thin fluid, or by excoriations, with serous exudations, concreting into crusts. — *Spec.* : 1st. *E. simplex* ;—2d. *E. rubrum* ;—3d. *E. impetiginodes* ; — 4th. *E. mercuriale.* (*See* Eczema.)

54. Genus vii. — Herpes. — An eruption of vesicles, distinctly but irregularly clustered, upon inflamed bases, extending beyond the margins of the clusters, attended by tingling, concreting into lamellar scabs. — *Spec.* : 1st. *H. phlyctenodes* ; — 2d. *H. circinnatus* ; — 3d. *H. Zoster* ; — 4th. *H. præputialis* ; — 5th. *H. Iris.* (*See art.* Herpetic Eruptions.)

55. Genus viii. — Bullæ. — An elevation of the epidermis by an effusion of serum, often passing into a sero-puriform fluid, into large vesicles or blebs, which are generally round or oval, have a broad base, and vary in size from that of a pea to that of an egg. — *Spec.* : 1st. *Pemphigus* ; — 2d. *Rupia.* (*See arts.* Bullæ, Pemphigus, and Rupia.)

56. Genus ix. — Ecthyma. — An eruption of phlyzaceous pustules, always distinct, seated on a hard, inflamed base, and followed by dark scabs, leaving slight cicatrices or red stains, which disappear after some time. — *Spec.* : 1st. *E. acutum, vel E. vulgare* ; — 2d. *E. chronicum, vel E. cachecticum.* (*See art.* Ecthyma.)

57. Genus x. — Impetigo — *Mellitagra.* — The eruption of psydraceous pustules, commonly grouped in clusters, sometimes distinct, and forming yellowish, rough incrustations ; attended by itching, but by little or no fever. — *Spec.* : 1st. *I. simplex* ; — 2d *I. favosa, vel Porrigo favosa* : — 3d. *I. eczematosa* ; 4th. *I. rodens.* (*See art.* Impetiginous Affections)

58. Genus xi. — Acne — *Varus* — *Adenodermatitis.* — A pustular affection, appearing chiefly about the period of puberty in both sexes, occurring as small, isolated pustules, with hard, deep-red bases, leaving circumscribed, indolent, and hard tumours, and seated chiefly in the sebaceous follicles, most frequently of the face, neck, shoulders, and breast. — *Spec.* : 1st. *A. simplex* ; — 2d. *A. indurata* ; — 3d. *A. rosacea.* (*See art.* Acne)

59. Genus xii.—Furunculus.— Inflammation limited superficially, but extending to all the cutaneous tissues and subjacent cellular substance, forming a hard, conical tumour, of a dull red colour, varying from the size of a pea to that of a pigeon's egg, terminating in suppuration, with the evacuation of a membranous slough, or of the membrane that inclosed the matter. — *Spec.* : 1st. *F. vulgaris* ; — 2d. *F. asthenicus* ; — 3d. *Hordeolum*, or *Stye.*

60. Genus xiii. — Carbunculus. — Circumscribed, hard, round, and painful swelling, seated in the cellular tissue of the skin and the subcutaneous tissue ; at first of a livid red colour, afterwards black, or of a deep livid hue in the centre or throughout, and covered by lenticular vesicles ; terminating in gangrene or sloughing. — *Spec.* : 1st. *C. sporadicus* ; — 2d. *C. endemicus* ; — 3d. *C. symptomaticus.* (*See art.* Furuncular Eruptions.)

61. Order III.—Squamosæ—*Dermatites squamosæ*—*D. serpiginosæ*— *D. chronicæ*—*Serpigines.* — Chronic affections characterised by the production, on the surface of the skin, of inorganic, laminated scales, of a whitish grey colour, dry, friable, and slightly elevated above the skin, which remains red and dry when the scales fall off. They are generally slowly developed, spread, and continue for months, or even for many years. They are not contagious.

62. Genus i. — Pityriasis. — A superficial affection, implicating chiefly the cuticle, characterised by a copious desquamation and renewal of this tissue, and, although it may appear on any part, affecting chiefly parts covered by hair. — *Spec.* : 1st. *P. Capitis* ; — 2d. *P. Palpebrarum* ; — 3d. *P. Labiorum* ; — 4th. *P. palmaris et plantaris* ; — 5th. *P. præputialis et pudentalis* ; — 6th. *P. versicolor* ; — 7th. *P. nigra.* (*See art.* Pityriasis.)

63 Genus ii. — Psoriasis. — *Lepriasis* — Patches of chronic inflammation of the skin, with slight elevations changing into scales, — those of *psoriasis* being of different sizes, with irregular margins, and the centres not depressed ; those of *Lepriasis* being more or less rounded, slightly depressed in their centres, and their margins raised

and reddish. — *Spec.:* 1st. *Psoriasis guttata ;* — 2d. *P. diffusa ;* — 3d. *P. inveterata ;* — 4th. *P. lepræformis* — *Lepriasis.* (*See arts.* Psoriasis and Lepriasis.)

64. Order IV. — Hæmatodes — *Sanguineous Exudations.* — Infiltrations of blood in the cutaneous and subcutaneous tissues, generally without manifest elevation of the surface, owing to impaired vital cohesion of these tissues, and of their capillaries, and to alteration of the blood.

65. Genus i. — Purpura. — Small, distinct, purple specks or patches in the skin, attended by languor and debility, generally without fever. — *Spec.:* 1st. *P. simplex ;* — 2d. *P. hæmorrhagica ;* — 3d. *P. urticans ;* — 4th. *P. symptomatica vel associata*—of exanthematous and continued fevers. — (*See art.* Purpura.)

66. Genus ii. — Scorbutus. — The appearance of patches or blotches of a livid, reddish, or purplish hue, chiefly on the lower limbs, with swelling and bleeding of the gums, great debility, and pains, and contractions of the lower extremities, &c. — *Spec.:* 1st. *S. sine Febre ;* — 2d. *S. febrilis.* (*See art.* Scurvy.)

67. Genus iii. — Petechiæ — *Ecchymoses.* — Small spots, generally of a reddish colour, but often livid, violet, or blackish, scattered over the surface of the skin, sometimes resembling flea-bites, or small freckles, remaining a longer or shorter time, varying from an imperceptible point to the size of a hempseed, occurring with or without fever, but most frequently in the advanced stages of adynamic fever. — *Spec.* 1st. *P. primariæ, vel P. sine Febre ;* — 2d. *P. secundariæ.*

68. Order V. — Exanthemata — Febres Exanthematicæ — Dermatites Exanthematicæ — Eruptions of various kinds, preceded by fevers of specific natures and fixed durations, the eruptions being generally also of determinate durations, spreading by infection and contagion, or by both—by specific contaminating miasms, or animal poisons, and generally affecting the œconomy only once. (*See arts.* Exanthematous Diseases and Infection.)

69. Genus i. — Rubeola — Morbilli — *Measles.* — Fever, with frequent sneezing, coryza, redness of the eyes, lachrymation, followed generally on the fourth day by a crimson rash, consisting of stigmatised dots, slightly elevated, on the face, neck, breast, and trunk, usually desquamating on the seventh, occurring frequently epidemically, spreading by infection, and affecting the system only once. — *Spec.:* 1st. *R vulgaris ;* — 2d. *R. complicata ;* — 3d. *R. maligna ;* — 4th. *R. sine Catarrho ;* — 5th. *R. sine Exanthemate.* (*See art.* Measles.)

70 Genus ii. — Scarlatina — *Febris Scarlatinosa.* — A continued fever, on the second or third day of which, a scarlet efflorescence generally appears on the fauces, face, and neck, spreading over the body, terminating in desquamations from the fifth to the seventh day, frequently attended by affection of the kidneys, and followed by dropsy ; often occurring epidemically, propagated by infection, and attacking the system only once. — *Spec.:* 1st. *Scarlatina Hominum.* — *Var.:* *a. S. simplex ;* — *b. S. anginosa ;* — *c. S. maligna ;*—*d. S. sine Exanthemate ;* — *e. S. latens.* (*See art.* Scarlet Fever.) *Spec.:* 2nd. *Scarlatina rheumatica, vel S. r. epidemica* (*see art.* Scarlatina Rheumatica) ; — 3d. *Scarlatina Equi*, vel S. Equi epidemica ;*—4th. *Scarlatina Canis.*

71. Genus iii. — Febris Exanthematica — *Typhus* — *Typhus exanthematicus.* — Typhoid, low, or adynamic fever, attended by stupor, vertigo, confusion of ideas, delirium, or typhomania ; by a reddish, papillar eruption on the trunk of the body and limbs ; propagated by infection, appearing epidemically, and seldom affecting the system a second time. — *Spec.:* 1st. *F. Typhoides ;* — 2d. *Typhus contagiosus.* (*See art.* Fever, Typhoid and Typhus, § 485. *et seq.*)

72. Genus iv. — Variola — Small-Pox. — Fever, commencing with shivering, and, after forty-eight hours, or three days, attended by an eruption of red points, passing successively into pimples, acuminated vesicles, flattened and umbilicated vesicles, pustules, and hard brown scabs ; ceasing on the development of the eruption, and returning when the eruption has reached its acme, or from the eighth to the eleventh day ; the falling off of the scabs, from the twelfth to the twenty-fourth day, leaving behind them dark pits or marks ; highly contagious, and affecting the system only once. — *Spec.* 1st. *Variola Hominum.* — *Var.:* *a. V. discreta ;* — *b. V. confluens ;* — *c. V. sine Variolis.* — *Spec.* 2d. *Variola Animalium.* — *Var.:* *a. V. vaccina ;* — *b. V. ovilis, vel Clavus.* — *Spec.* 3d. *V. varioloidea, vel Variola Hominis anomala.* (*See arts.* Small-Pox and Vaccination.)

73. Genus v. — Varicella — *Chicken-pox.*— an eruption of semi-transparent, glabrous vesicles, with red margins, following and attended by a slight attack of fever ; the vesicles seldom passing into suppuration, but breaking on the third or forth day, concreting into small puckered scabs, and leaving no cicatrices ; affecting a person only once. — *Spec.:* 1st. *V. lentiformis ;* — 2d. *V. coniformis ;* — 3d. *V. globularis.* (*See art.* Chicken-Pox.)

74. Genus vi. — Miliaria — *Sudamina.*—An eruption of whitish or pale reddish vesicles, the size of a millet-seed, in the course of severe infectious fever ; the vesicles being distinct, containing a serous fluid, of a whitish, or reddish, or purplish hue, bursting in two or three days, and terminating in a scurfy desquamation. — *Spec.:* 1st. *M. simplex ;* — 2d. *M. abnormis.* (*See art.* Miliary Eruptions.)

75. Genus vii. — Erysipelas. — Asthenic inflammation of the integuments, consequent upon febrile disorder and a morbid state of the blood, affecting the skin or scalp more or less extensively, with a diffused swelling disposed to spread, propa-

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* I have lately had reasons, indeed evidence, for the following inferences: — 1st, That Scarlatina was originally a disease of the horse ; and that it formerly occurred, and has even recently occurred, epidemically, or as an epizooty among horses ; 2d, That it was communicated in comparatively modern times from horses to man ; 3d, That it may be, and has been communicated also to the dog.

Whilst this article was passing through the press, and after the preceding part of this note was printed, Mr. Percival, Veterinary Surgeon to the 1st Regiment of Life Guards, and author of the very able and well known work on the Diseases of the Horse, kindly furnished me with additional evidence in support of the opinion I have stated at this place, and when treating of Scarlet Fever. (*See that article*, §§ 90., &c.) Mr. Percival also referred me to the second volume of his work, where Scarlatina in the Horse is mentioned.

gated by infection when circumstances favour the operation of the poisonous miasm. — *Spec.:* 1st. *E. simplex;* — 2d. *E. complicatum.* (*See art.* Erysipelas.*)

76. Order VII. — Dermatites contagiosæ — D. specificæ contagiosæ — Aischrodes — *Eruptiones contagiosæ* — *Contaminating Eruptions.* — Eruptions propagated by direct or mediate contact, of indeterminate, but generally prolonged duration, often contaminating the whole frame; and certain of them tending to fatal terminations.

77. Genus i. — Scabies — *Itch.* — An eruption of distinct, slightly acuminated vesicles, attended by constant itching; the eruption varying in character, but often concealing a parasite or *acarus*, either causing, or produced by it, unattended by constitutional disturbance. — *Spec.* 1st. *S. Hominis;* — *Var.: a. S. H. vesicularis;* — *b. S. papuliformis;* — *c. S. lymphatica;* — *d. S. purulenta;* — *e. S. cachectica.* — *Spec.* 2d. *Scabies Canis.* (*See art.* Itch.)

78. Genus ii. — Sycosis — *Mentagra.* — A pustular eruption of a pale yellow colour, seated chiefly in the hairy parts of the face, as the chin, upper lip, cheeks, &c., affecting the hair follicles and connected tissues, bursting in the course of some days, and producing brownish crusts, which after one or two weeks leave indolent purplish tubercles; the pustules being renewed in different parts, thus continuing for an indeterminate period, and apparently propagated by a parasitic plant, or cryptogamic formations. — *Var.:* 1st. *S. simplex;* — 2d. *S. contagiosum.* (*See art.* Sycosis.)

79. Genus iii. — Favus — Tinea — *T. maligna* — *Porrigo* — *Ring-Worm.* — A specific chronic inflammation, seated chiefly in the hair-follicles, exuding a peculiar yellowish substance, which accumulates and forms a cup around the base of each hair, the aggregation of a number of these resembling the cells of a honey-comb The hair of the diseased follicles is altered, imperfectly nourished, and falls out; and if the disease be not arrested, the subjacent tissues become affected. This contaminating eruption is usually seated in the scalp, sometimes extending to the face, neck, and other parts of the body, and is communicable to any part of the skin. — *Var.:* 1st. *F. dispersus;* — 2d. *F. confertus.* (*See art.* Tinea.)

80. Genus iv. — Pustula Maligna — *Contagious Anthrax.* — A large vesicle filled with a sanious fluid, seated over a lenticular induration, which is speedily surrounded by an erysipelatous areolar swelling, which soon becomes gangrenous, and contaminates the circulating fluids; caused by the contact of a septic animal poison, and communicable from person to person, and from the lower animals to man. — *Spec.:* 1st. *P. M. Hominis;* — 2d. *P. M. Animalium.* (*See art.* Pustule, Malignant.)

81. Genus v. — Glanders† — Farcy — *Farcy-Glanders.* — Fever of a low and malignant character, attended by chancry sores of the membrane of the nose, and a profuse, offensive discharge, and by pustular eruptions, or tubercular, gangrenous ulcers, in various parts of the cutaneous surface, produced by the contact of the poisonous matter. — *Spec.:* 1st. *Simple Acute Glanders;* — 2d. *Acute Farcy Glanders;* — 3d. *Simple Chronic Glanders;* — 4th. *Chronic Farcy Glanders.* (*See art.* Glanders.)

82. Genus vi. — Syphilis — *Syphilitic Eruptions* — *Venereal Eruptions.* — A distemper contracted, generally by impure contact, and characterised, externally, by copper-coloured spots, or by pustules, vegetations, excrescences, ulcerations, swellings, tumours, or imposthumes; internally, by pains in the bones or periosteum, or by caries. — *Spec.* 1st. *S. eczematosæ.* — *Var.: a. lenticularis;* — *b. papularis;* *c. vesicularis;* — *d. pustularis;* — *e. tubercularis.* — *Spec.* 2d. *S. squamosa.* — *Var.: a. Leprosa;* — *Psoriasis.* — *Spec.* 3d. *S. vegetans.* — *Var.: a. verrucosa;* — *b. Condyloma;* — *c. Cauliflora;* — *d. Frambœsia;* — *e. Crista-Galli.* — *Spec.* 4th. *S. exulcerans.* — *Var.: a. serpiginosa;* — *b. fissata;* — *c. excavata.* (*See art.* Syphilitic Affections.)

83. Genus vii. — Mycosis. — A contagious disease, consisting of fungous excrescences, occurring chiefly on the face, hairy scalp, or about the organs of generation, resembling a mulberry or strawberry, exuding a yellowish, fœtid, and viscous humour, sometimes forming tumours of considerable size, and often attended by pains in the bones, by hoarseness, coryza, or ozœna, ulceration of the tonsils, &c. — *Spec.:* 1st. *M. Frambesioides, Frambœsia;* — 2d. *M. Molluscum, Amboyna-pox;* — 3d. *M. syphiloides, Sibbens,* &c.

84. Order VIII. — Leprodes — *Leprous Eruptions.* — Morbid degenerations of the skin, depending upon constitutional vice, attended by diminution of the sensibility of the diseased surface, by general hypertrophy of the cutaneous tissues, by originating in endemic influences and bad food, insensibly and slowly, and by their very prolonged duration and hopeless cure.

85. Genus i. — Lepra Tuberculosa — Leprosy — *Leprosy of the middle ages* — *Lepra Hebræorum.* — Dusky-red or livid tubercles, of various sizes, on the face, ears, and extremities; a rugous and thickened state of the skin, impaired sensibility and falling out of the hair, excepting on the scalp; hoarse or altered voice, and ozœna; terminating in ulcerations of the affected surface, and extreme fœtor; the distemper being often hereditary, and even contagious by means of the matter discharged from the sores. — *Spec.:* 1st. *Lepra Taurica* — the Leprosy of the Crimea; — 2d. *L. anæsthesiaca;* — 3d. *L. Hebræorum* — Jewish or Egyptian Leprosy. (*See art.* Leprosy.)

86. Genus ii. — Radesyge. — Lassitude, torpor, and heaviness of the limbs, stiffness and pains of the joints; a pale, bloated, leaden, or reddish appearance of the face, hoarseness of the voice, ozæna; a rugous, scaly, and callous state of the skin, especially in parts, followed by cracks, furrows, tuberculous callosities, and ulcers. — *Spec.:* 1st. *R. vulgaris;* — 2d. *R. scorbutica.*

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* The several forms and states of complication manifested by *Erysipelas* are fully described, in the article referred to, as they have been observed in many countries and climates by the author, and during different epidemic constitutions.

† This malignant and contaminating distemper is generated in horses from crowding, and from breathing a contaminated or foul air, and is communicated from them to man. There is great reason to believe, that most, if not all the maladies comprised under this order, have originated in some of the lower animals, and have extended, with various modifications, to man; and not improbably small-pox has had a similar origin as well as scarlet fever, as already mentioned.

87. Genus iii. — Elephantia — *Elephantiasis of the Arabians.* — Hardness, lividity, and great tumefaction of one or both limbs, or of the scrotum, owing to great thickening of the cutaneous and subcutaneous tissues, with an irregular, glabrous, or scaly state of the surface; endemic chiefly in warm countries. — *Spec.*: 1st. *E. vulgaris*; — 2d. *E. tuberosa*; — 3d. *E. Scrotatis.* (*See art.* Elephantiasis.)

88. Genus iv. — Pellagra. — An endemic and hereditary malady, characterised by thickening, scaly excoriation, cracks, and deep fissures of those parts of the skin exposed to the sun or air; attended by general cachexia, by burning pains in the trunk and limbs, by disorder of the digestive organs and nervous system; at first appearing after prolonged intervals, afterwards being more continued, and often fatal. — *Spec.*: 1st. *P. Milanensis*; — 2d. *P. Asturiensis.* (*See art.* Pellagra.)

89. Genus v.—Ichthyosis. — Morbid enlargement of the papillæ of the skin, and thickening of lamellæ of the epidermis, either in parts, or more or less generally, presenting irregular compartments often resembling the scales of fish. — *Spec.*: 1st. *I. hereditaris*; — 2d. *T. papillaris*; — 3d. *I. localis.* (*See art.* Ichthyosis.)

90. Order IX. — Cancrodes — *Cancerous Distempers.* — Cancerous diseases of the skin are characterised by their slow and insidious attack; by their prolonged duration; by their foul ulceration and lancinating pains; by their resistance to treatment, and by their general return to adjoining or remote parts, after removal by excision: they depend on a peculiar diathesis, which is often hereditary.

91. Genus i. — Lupus — *Cancer Lupus*, Sauvages.—A disease of all the tissues of a portion of the skin, chiefly of the face, implicating also the subjacent cellular substance; of remarkably slow progress and long duration; always extending either superficially or in depth, with a stinging sensation of heat; passing into ichorous and slow phagedenic ulceration, and destroying the textures to which it extends.—*Spec.*: 1st. *L. superficialis*; — 2d. *L. phagedænicus*; — 3d. *L. non-exedens serpiginosus.* (The different species of Lupus form the connecting links between the *leprous* and the *cancerous* diseases of the skin. *See art.* Lupus.)

92. Genus ii. — Carcinus. — An alteration of all the tissues of the skin and subjacent cellular tissue, generally commencing as a small, hard, indolent tumour, with itching or stinging; passing into pungent or lancinating pains, and often attended or followed by ichorous and slow ulceration, and by general contamination of the frame. —*Spec.*: 1st. *C. scirrhosus*, — *Carcinoma*; — 2d. *C. verrucosus* (Chimney-Sweeps' Cancer): — 3d. *C. medullaris*; — 4th. *C. melanæus*; — 5th. *C. eburnæus.* (*See arts.* Cancer and Scirrhous and other Tumours.)

93. Genus iii. — Kelis. — A prominent, hard excrescence, sometimes cylindrical, sometimes round or square, flattened in the centre and elevated at the margin, projecting roots into the skin. — *Spec.*: 1st. *R. genuina*; — 2d. *R. spuria.*

94. Order X. — Heteromorphæa. — Alterations of the skin, cuticle, or nails, not comprised under the foregoing, nor referable to changes or morbid actions similar to, or allied with, those which characterise the preceding groups.

95. Genus i. — Nævus — *Vascular Nævi — Moles.* — A congenital alteration of a portion of the skin, consisting either of a convoluted congeries of capillary vessels, more or less elevated, in the form of a small vascular tumour, above the surface, or of a more diffused and dark or livid-coloured patch, or of a warty, hairy, or discoloured elevation or excrescence. — *Spec.*: 1st. *N. vascularis circumscriptus*; —2d .*N. vascularis diffusus*; — 3d. *N. non-vascularis*; — 4th. *N. pilosus.*

96. Genus ii. — Verruca — *Warts.* — A very circumscribed, hard, excrescence, sessile or pedunculated, sometimes moveable, sometimes more fixed, of nearly the same colour as the skin, its surface being rugged, horny, or hard, and not susceptible of inflammation, although the cutaneous papillæ to which it is attached is more than usually vascular. — *Spec.*: 1st. *V. vulgaris*; — 2d. *V. Acrochordon.*

97. Genus iii. — Tylosis — *Corns* — Circumscribed, dry, hard, lamellated callosities, owing to hypertrophy of the cuticle from pressure, which drives the altered structure inwards upon the subjacent tissues, developed chiefly on the toes. — *Spec.*: 1st. *T. indurata*; — 2d. *T. gomphosa*; — 3d. *T. bulbosa.*

98. Genus iv. — Onygosis. — Inflammation with swelling, redness, and pain of the matrix of the nail, causing malformation, induration, eversion, or inversion of the nail. — *Spec.*: 1st. *O. acuta*; — 2d. *O. chronica*; — 3d. *O. cum Inversione*; — 4th. *O. cum Eversione*; — 5th. *O. complicata vel associata.* (Often associated with *Psoriasis* and *Lepriasis*, which see § 23.)

99. Having exhibited what may be considered a strictly *natural grouping* or *classification* of the changes, appearing either primarily in the tissues of the skin, or contemporaneously with, or consecutively upon, febrile and constitutional diseases, it will be seen that the local connections, the symptomatic relations, and the more prominent features and alliances of these changes, are brought more completely and more accurately under view. And it will be more clearly perceived, that these affections of the skin, so difficult to arrange, and so generally considered and treated as local alterations merely, are more or less important manifestations, in the cutaneous tissues, of disordered or diseased conditions of one or more of the vital functions, — of the organic nervous influence or energy, of the digestive and assimilating functions, of the depurating or eliminating functions, and, consequently, of the circulating fluids, and of the constitution or frame in general. Thus, a natural arrangement of cutaneous affections directs the attention more entirely to the relations, and constitutional and visceral dependencies, of these affections, and leads to rational and successful methods of cure; most of the affections grouped under the same order manifesting such morbid relations and connections, as require similar indications and means for each.

100. As *artificial arrangements of cutaneous diseases* have been so commonly received, and as they tend to facilitate diagnosis, I shall conclude this subject by giving the improved modification of the classification of Willan, by M. Rayer; the arrangement of Willan being itself only a modification of that originally published by Plenck.

TABLE.

- **DIVISION I.** Diseases of the Skin.
  - **Chapter I.** Inflammatory Affections, distributed according to the Number and Form of their elementary Lesions.
    - **Section I.** Having a single elementary Form.
      - 1. Exanthemata.— Erythema, Erysipelas, Rubeola, Roseola, Scarlatina, Urticaria; Artificial Exanthemata.
      - 2. Bullæ. — Pemphigus, Rupia; Artificial Bullæ — Blisters, Ampullæ.
      - 3. Vesiculæ. — Herpes, Eczema, Hydrargyria, Scabies, Miliaris sudatoria (*suette miliaire*), Sudamina; Artificial Vesicles.
      - 4. Pustulæ. — Variola, Varicella, Vaccinia, Vaccinella, Acne, Rosacea, Sycosis, Impetigo, Favus, Ecthyma; Artificial Pustules.
      - 5. Furunculi. — Hordeolum, Furunculus, Anthrax.
      - 6. Gangrenæ. — Anthracion vel Pustula maligna, Anthrax Pestis.
      - 7. Papulæ. — Strophulus, Lichen, Prurigo; Artificial Papulæ.
      - 8. Squamæ. — Pityriasis, Psoriasis, Lepra, Pellagra; Artificial Squamæ.
      - 9. Tubercula. — Lupus, Scrofula, Cancer; Elephantiasis Græcorum; Artificial Tubercles.
    - **Section II.** Having several elementary Forms.
      - 1. Syphilis.
        - Exanthematica, Bullosa, Vesiculosa, Pustulosa, Squamosa, Papulosa, Tuberculosa, Vegetativa.
      - 2. Ambustio.
        - Exanthematica, Bullosa, Gangrenosa.
      - 3. Pernio.
        - Exanthematica, Bullosa, Gangrenosa.
  - **Chapter II.** Peculiar States of the Skin not referable to Inflammation.
    - Anemiæ.
    - Congestus sanguinei.
    - Hæmorrhagiæ.
      - Purpura (Petechiæ, Vibices, Ecchymoses, Dermatorrhagia).
  - **Chapter III.** Morbid States of the secreting Functions of the Skin.
    - Perspirationis Ephidrosis.
    - Epidermidis Exfoliatio.
  - **Chapter IV.** Neuroses of the Skin.
    - Anæsthesia, Hyperæsthesia.
  - **Chapter V.** Faulty Structure, or unusual States of one or other of the Elements of the Skin.
    - Pigmenti (Achromata; Dyschromata).
      - Albinismus seu Leucopathia, Nigrities, Ephelis, Lentigo, Chloasma, Melasma, Nævus pigmentarius, Color cæruleus, Color subflavus; Artificial Discolorations.
    - Hypertrophiæ. Gangræna simplex. Cicatrices. Defectus congenitus Cutis. Extensio vel Relaxatio insolita Cutis.
      - Papillarum et Epidermidis.
        - Ichthyosis, Verruca, Producta cornea, Tylosis.
      - Vasorum Cutis.
        - Phlebectasia, Angiectasia capillaris, Nævus araneus flammeus, &c. Tumor vascularis.
      - Corii, Membranæ cellularis subcutaneæ, et Telæ adiposæ.
        - Cheloidea, Tumores varii, Elephantiasis Arabica. Andrum, et Pedarthoræ, Barbadoes Leg, &c.
  - **Chapter VI.** Degenerations.
    - Degenerationes fibrosæ.
    - Melanosis.
    - Degenerationes tuberculosæ.
- **DIVISION II.** Alterations of the Dependencies of the Skin.
  - **Chapter I.** Special Diseases of the Sebaceous Follicles.
    - Secretio aucta, Vermes sebacei, Levatio follicularis, Tumor follicularis, Calculi Folliculorum.
  - **Chapter II.** Special Diseases of the Piliferous Follicles.
    - Atrophia, Defectus congenitus Pilorum, Pili supernumerarii; Incrementum insolitum Pilorum, Coactio Pilorum, Alopecia, Canities, Plica.
  - **Chapter III.** Special Diseases of the Unguial Matrices and Alterations of the Nails.
    - Onychia, Vicia Confirmationis et Structuræ Unguium; Ecchymosis subunguialis; Incrementum insolitum Unguium; Situs insolitus; Ficus; Defædatio, Degeneratio; Productio et Reproductio, &c.
- **DIVISION III.** Foreign Bodies on the Surface, under, or in the Substance of the Skin.
  - Parasitic Insects infecting the Skin of Man.
    - Pediculi; Pulices; Acarus Scabiei; Filiaria medinensis; Œstrus.

101. I may further add the arrangement proposed by Professor J. H. Bennett, of Edinburgh. He excludes from the orders *Exanthemata* and *Pustulæ* the diseases characterised by excessive fever, as being essentially febrile. From the order *Vesiculæ* he also removes miliaria and varicella, for a similar reason; and he expunges the order *Bullæ* altogether. With some other alterations, consisting chiefly of reductions of genera to the rank of species, he assigns the following as his classification of skin-affections. It will be seen that it is a modification, with several omissions, of the arrangement generally adopted *of diseases of the skin*; whilst in that which I have given above, I have comprised also the principal of those maladies which generally also *affect or implicate the skin* in a more or less obvious manner:—

Order i. *Exanthemata.*
Erythema.
Roseola.
Urticaria.
Ord. ii. *Vesiculæ.*
Eczema.
Herpes.
Scabies.
Pemphigus.
Ord. iii. *Pustulæ.*
Impetigo.
Ecthyma.
Acne.
Rupia.
Ord. iv. *Papulæ.*
Lichen.
Prurigo.
Ord. v. *Squamæ.*
Psoriasis.
Pityriasis.
Icthyosis.
Ord. vi. *Tuberculæ.*
Lepra tuberculosa.
Lupus.
Molluscum.
Ord. vii. *Maculæ.*
Lentigo.
Ephelides.
Nævi.
Purpura.
Ord. viii. *Dermatozoa.*
Entozoon folliculorum.
Acarus.
Pediculus.
Ord. ix. *Dermatophytæ.*
Porrigophyte (Favus).
Mentagraphyte (Mentagra).

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(Gives this, the earliest, diagnosis between Small-pox and Measles: " *Variola*, at an early period, presents an eminence or elevation above the surface: *Morbillus* is less elevated than variola, and approaches the eye less; it is attended by more lachrymation and less pain of the back." He distinguishes also between Scabies and Prurigo.) — *Avenzoar*, De Rectificatione et Facilitatione Medicationis et Regiminis, fol. Venet. 1549. (The first to mention the *Acarus Scabiei.*) — *Theodorici* Chirurgia, fol. 1519. — *Gilbertus Anglicanus*, Laurea Anglicana seu Compend. totius Medicinæ, 4to. Lugd. Bat. 1510. (Described the Leprosy of the Middle Ages). — *Torella*, De Pudendagra Tract. &c. In Aphrodisiacus *Luisini*, fol. Lugd. Bat. 1728. — *Fracostorius*, Syphilis, sive de Morbo Gallico, libri tres. 4to. Veronæ, 1535., et De Morbis Contagiosis, lib. ii. cap. 15. 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SLEEP AND SLEEPLESSNESS. — Classif.: — General Pathology—Symptomatology — Therapeutics.

1. Definit. — i. Sleep. — *The suspension of sensation and voluntary motion, occurring at periodic intervals, continuing for some hours, then terminating spontaneously, or by some irritation or excitement, being indispensable to the due discharge of all the sensory, intellectual, and voluntary functions.*

ii. Sleeplessness. — *The non-recurrence of this periodic suspension of sensation and voluntary motion, or the imperfect or interrupted recurrence of it, as a symptom of disease, or as the chief manifestation of disease.*

2. I. Sleep is necessary to the due discharge of the sensory, intellectual, and voluntary functions, for any considerable period; and if that period be much prolonged beyond eighteen or twenty hours, even during states of excitement or anxiety, an overpowering disposition to sleep is experienced; although powerful constitutions, on trying occasions, may continue awake for much longer periods. The organic functions, or those functions which are actuated by the organic, nervous, or ganglial system, and which consist chiefly of digestion, assimilation, circulation, nutrition, and secretion — all these functions, commonly termed involuntary—require not the suspension or repose constituting sleep, which, if extended to them, would soon terminate life. But these functions are performed — at least, some of them —with less activity during this period. Sleep is not only indispensably requisite to the adequate discharge of the functions performed by the cerebro-spinal nervous system, but is also necessary to the due nutrition of this system — to the due supply of the waste of nervous power, and even of intimate nervous organisation, required for the healthy performance of the functions of this system. Whilst the ganglial nervous system, on the one hand, discharges its functions through the media of the several organs actuated by it almost continuously, and without marked repose or waste of substance or structure, the cerebro-spinal nervous system, on the other hand, demands periodic or alternate repose and action, in order to insure its healthy function and organisation, and to prevent excessive exhaustion and waste.

3. The restoration of cerebro-spinal nervous power consequent upon sleep has been, by some physiologists, attributed to the due nutrition of the cerebro-spinal organs during this period, as much as to the suspension of exhaustion and waste, this restoration and nutrition being requisite in proportion to the antecedent waste, which, if not duly restored, successively increases until the intimate organisation of these nervous centres ultimately undergoes irreparable and tangible change. In early age and during manhood, the voluntary actions and mental exertion may be continued during comparatively long periods without exhaustion, for nutrition, or the restoration of the nervous expenditure, is then more rapid and complete than in advanced or old age; whereas, at this age, these efforts, especially such as are of a very exhausting nature, are followed by a more prolonged and a more urgent want of repose; and if repose be not obtained, disease, or even disorganisation, more especially inflammation, in the earlier epochs of life, and apoplexy and paralysis in advanced age, may speedily supervene. Thus we observe that when, in advanced life, mental exertion, bodily fatigue, or venereal indulgences are carried too far, the disposition to sleep is most urgent, and, if the required repose be not obtained, the risk from the supervention of these maladies becomes great.

4. The seat of consciousness, or of active sensation, has been long since supposed by some writers to be different from that of the mental faculties; and it has been believed that, whilst the former is in the central and basilar parts of the brain, the latter are to be referred to the convolutions of the hemispheres. During sleep, therefore, the more central parts, the seats of sensation, are altogether inactive, or incapable of feeling or perceiving impressions made upon the senses, and thence conveyed to those parts, unless the impressions be so strong as to rouse them to a state of activity: but whilst sleep consists of the inaction or repose of these parts, and of the hemispheric convolutions as well, when sleep is complete or profound, a less profound form of sleep consists of a less complete state of inaction of both the hemispheric convolutions and the central cerebral structures. This latter, or imperfect state of sleep comprises numerous phases or grades from that attended by indistinct *dreams*, through the various states of *dreaming*, until the half-waking and half-sleeping state is reached.

5. During *dreaming*, the structures of the brain more especially concerned in the mental manifestations are not completely or entirely in a state of repose, nor can it be admitted, that the seats of conscious sensation are also completely or profoundly inactive, otherwise the former manifestations could not be perceived or remembered by the latter. It will be, therefore,

more correct to view the several portions of the brain concerned in sensation, mental manifestation and volition, as not completely, although more or less, inactive during sleep, unless the sleep be very deep, and altogether without dreams; for, more frequently, especially when the dreams are distinct, and are recollected upon awakening from sleep, certain parts of the brain continue more or less active, repose not being universal and complete. Dreaming during sleep in health may be rendered more vivid and remarkable by the excitement of the brain during the various mental or physical exertions of the day, or by the nature of the food or drink, or by disorders of the digestive functions, the imagination and reasoning powers being either partially or actively exercised, and the results of these being remembered when waking. This partial or irregular activity of the hemispheric portions of the brain during sleep is often still more strongly manifested during the imperfect sleep of fever, and is even expressed more or less audibly and actively; those suggestions, conceptions, and unconnected ideas, constituting dreams in health, passing into more or less manifest delirium in states of disease. Thus various grades of sleep and of dreaming may exist either occasionally or habitually during the ordinary health of the individual; and thus, during disease, various grades or phases of delirium, passing into sopor, lethargy, and coma, may occur, as the states of nervous power and of the circulation may favour their appearance.

6. During sleep, especially when it is not profound, the sensorium may be influenced in various ways, so as to give rise to changes of position, to various conceptions, and even to acts, without a conscious perception of them. An uneasy position, or the muscular sense, may occasion during sleep a complete change of position, — a person may turn from one side to the other, without being conscious of either the cause or the act of turning. In this case, the uneasiness influences the sensorium, or induces an unconscious sensation sufficient to give rise to a similarly unconscious volition productive of the act, but there is no perception of it. During dreaming, the conception of numerous occurrences, circumstances, and acts, passes through the mind with greater or less rapidity, and generally in a very incongruous and unconnected manner. The various processes of thought which had engaged the waking brain are often partially renewed or suggested during sleep, or while the mind is unconscious of impressions on the senses, frequently in singular forms, or with inconceivable rapidity, or in disjointed or impossible states; these suggestions or conceptions being, however, sufficiently strong, in many cases, to excite conscious sensation, so far, at least, as to be partially remembered on waking.

7. These suggestions seldom amount to perfect conceptions, but are loose and unconnected, generally faintly entertained, and soon extinguished. They are the results of imperfect or disordered states of repose of the parts of the brain more especially concerned in the mental processes. They may occur without any excitement or stimulus of the senses, or of parts distant from the brain, as apparitions merely of anterior processes of thought or of acts, in partial or newly-combined and bizarre forms, without any circumstance which can account for their appearance; and they may assume the most lively characters, and be attended by more or less correct reasoning, and by the highest flights of imagination. But in some instances, they may be referred, with great accuracy, to antecedent occurrences, occupations, or mental processes, of which they are the imperfect or distorted remains or apparitions, although sometimes the most lively or intense, but also the most incongruous conceptions. In other cases they are excited by local impressions, or irritants, or changes which sympathetically affect the brain, so as to give rise to those conceptions which constitute dreams, or even to acts, which those conceptions occasion. Thus the irritation of the bladder may give rise, during sleep, to conceptions connected with micturition, and this act may even follow without waking, although it generally immediately terminates the sleep. Thus, also, irritation of the vesiculæ seminales produces lascivious dreams, and not infrequently is followed by seminal emission. Various internal excitants, moreover, or external agents, acting during sleep, may be followed by dreams having a more or less obvious connection with the causes which produced them; the impressions made by such agents calling up certain related, although incongruous or disjointed conceptions in the sensorium.

8. The conceptions arising in the manner now explained, — either with or without any obvious excitant or physical cause, — may be so slight and evanescent as hardly to be remembered upon awaking, and as not to occasion any change of position, or any act implying volition, of either a conscious or unconscious kind. But not infrequently the conceptions formed during sleep, when lively or active, give rise to volition, and are followed by acts. The individual acts the dream, or performs the conception passing through his mind, without being so conscious of his act as to remember it when he awakes, or when the functions of sense and perception are fully restored. This constitutes *somnambulism*, or sleep-walking, a state of partial or imperfect sleep, which has been sufficiently noticed, in respect of its nature and relations, when treating of *the pathology of* PARALYSIS (see § 193. *et seq.*).

9. *Sleep*, that it may be refreshing and restorative to both body and mind, should, 1st., take place at a stated and proper hour, and after stated intervals; — 2d., continue for a certain period of time, without being prolonged much beyond that time; — 3d., be aided by the necessary preparations to secure ease of position, and to prevent disturbance of the vital and animal functions. When sleep is obtained without these precautions, — when it occurs at unseasonable hours, — when it is broken or unusually shortened, — when it is taken on a loaded stomach, or after the ingurgitation of heating or stimulating beverages, — when the position of the body is unusual, cramped, or uneasy, — when the stomach or bowels are distended by flatulence, or irritated by acidity, — then it is either disturbed or unsound, unrefreshing, — the body and mind are left on waking either languid or torpid, and the requisite exertions or engagements of the following day are entered upon with disrelish, and are soon productive of fatigue.

10. To secure refreshing sleep, a sufficiently early and a punctual period of retiring to repose should be adopted, after having spent a reasonable period in the open air, chiefly in exercise suited to

the state and constitution of the individual. The diet should be digestible and moderate in quantity, and such as will not favour flatulency or acidity. Repose ought not be taken for some hours after a full meal; and the place in which it should be sought ought to be airy and dry, the temperature being not above 70° of Fahr. or below 55°. The bed should be firm and moderately elastic, slightly elevated towards the head, and the clothes, both above and under the person, sufficiently warm and light. All the day-clothes should be taken off. The chamber ought to be large and airy, and light and noise excluded. If air be not sufficiently renewed in the sleeping apartment, sleep becomes feverish or restless, and the individual awakes unrefreshed and uncomfortable.

11. The *amount* of sleep should vary with the age, the occupation, the constitution, and the habits of the individual. During infancy and childhood, prolonged periods of sleep are required for the nutrition of the nervous masses and the growth of the body. Infants sleep the greater part of the twenty-four hours. Children require twelve or fourteen hours; older children, or those from eight years until fourteen or fifteen, about ten hours. From commencing puberty until full growth, or from twenty-five to thirty, eight hours are sufficient. After this age, the duration of sleep should range from six to eight hours, according to the occupations or exertions, mental or physical, of the individual.

12. *The causes of sleep* are not only the fatigue, the exhaustion, and the periodicity characterising all our sensorial actions and manifestations already insisted upon as requiring restoration and reinforcement of nervous power during the periods of repose, but also various states and phenomena which act more or less on the sensorium of those who are either incapable, or not in a situation, of having recourse to those mental or physical operations which more certainly conduce to repose. The entire *absence* of sensorial impressions, or the *monotonous repetition* of such impressions, will frequently occasion sleep, as occurs when listening to a drawling, monotonous reader or preacher, or to distant sounds of unvarying loudness. Persons who have become accustomed to sleep, notwithstanding the continuance of sounds which would keep the unaccustomed awake, frequently cannot sleep when deprived of these sounds, or when removed to perfect stillness, or when they are within the reach of sounds of a different intensity or key. Friction of various parts, especially in nervous or susceptible persons, prolonged combing of the hair, monotonous sounds of any kind, continued and gentle motions of the body in the same directions, rapid transport of the body backwards, or with the back placed towards the place where the body is carried, as when thus seated in a carriage, or on a railway, and directing the mind to uninteresting objects or matters, severally induce sleep, especially when other circumstances concur in causing this effect. There are, moreover, other causes which produce sleep, and which may be viewed as pathological, inasmuch as they are more or less morbid in their consequences or nature: they require merely enumeration. Venereal excesses may occasion sleep, lethargy, or sopor, especially in the aged; extreme exhaustion of the organic nervous and cerebro-spinal energies; a plethoric state of the brain, or of the vascular system generally; the superabundance of excrementitious materials in the blood, or an imperfect oxidation of this fluid; the administration of narcotising substances; and various related morbid affections induce sleep, either excessive as respects its continuance, or of a disordered or unrefreshing kind (see *art.* Coma and Lethargy).

13. *The accession of sleep* is very different in different persons, or when sleep supervenes naturally and healthily, and when it is induced artificially, or assumes more or less of a disordered character. Healthy sleep may occur either suddenly or gradually. Disordered sleep is generally slow and partial in its accession. The sensorium gradually loses its control over the current of the ideas, which becomes unconnected and incongruous; and in this state of transition, — of half sleeping and half waking, — a dreamy, or even a delirious existence is passed for a longer or shorter period, until an entire loss of sensibility of external objects, — a more complete torpor of the sensorial parts of the brain, — supervenes, and sounder sleep is induced. The disposition to, and indisposition from, sleep are very much in the power of the individual, for, by abstracting the mind from all objects of sense, and from the suggestions or ideas they excite, by ceasing every phase or mode of volition, and by ceasing to think upon or respecting any topic requiring mental exertion, or calculated to occasion mental excitement, or by directing the attention to, and fixing it on, a single, uninteresting, unexciting, or simple object, and engaging the thoughts with no other, the sensorium will soon lapse into that state of torpor productive of sleep.

14. The accession of sleep is often *attended by various morbid phenomena*, especially in persons predisposed or subject to any nervous, or spasmodic, or paralytic affection. These consist chiefly of startings, twitchings, contractions, or cramps, of one or more limbs or muscles; of convulsions and spasmodic laryngeal disorders, or croup, in children; of epileptic fits, more or less complete, or merely slight or partial, and even of various mental and spectral illusions. Any of the foregoing may occur upon the accession of sleep, and before sleep has become complete, or immediately upon falling asleep; or during the commencement of sleep, when sensation is partially or suddenly excited by any excitant, or disturbing cause.

15. *Awakening* from sleep may be either sudden or gradual. The healthy and sufficiently sound and prolonged sleep terminates spontaneously and immediately, leaving the person who has enjoyed it refreshed and active; or if it be terminated by impressions made upon the senses, these impressions produce this effect readily and completely, — an effect not observed from them when the sleep is of that morbid kind which constitutes lethargy, stupor, sopor, or coma, in its several morbid grades. Disordered, unsound, or insufficient sleep generally passes into that state of half sleeping and waking noticed above (§ 4.), and, according to the circumstances causing the disorder or unsoundness, is attended by the dreamy, or even by the delirious states of temporary existence just mentioned, until stronger impressions on the organs of sense, or diminished torpor of the sensorium, — the increased activity of the sensorial or conscious portions of the brain, — are followed by

the restoration of the several manifestations or functions of this organ.

16. *Sleep may be excessive.* — 1st. As respects its duration. — 2d. As regards its profound character, and the difficulty of arousing the person from it; and 3d. In the frequency of its recurrence. These are diseased states, and either amount to one or other of those described under the heads Coma and Lethargy, or generally pass into one or other of them, if not soon arrested by a treatment appropriate to the exciting and pathological causes which occasion them. Too profound or prolonged sleep should always excite suspicions of a disposition to, or the actual presence of, cerebral congestion, owing either to nervous exhaustion, or to a morbid state of the cerebral circulation, or to an interrupted return of blood from the brain, occasioned by pulmonary or cardiac engorgements, or to a morbid state of the blood itself. To one or other of these morbid conditions, excessive or deep sleep, especially when amounting to lethargy or sopor, may be imputed, the existence of either condition, or of more than one, generally becoming manifest upon a careful examination of the case.

17. II. Sleeplessness — *Wakefulness* — *'Αγρυπνία—Insomnia—Pervigilium*— is a symptom of disease, but it sometimes is also a forerunner of the worst forms of disease, or occurs before any very obvious disorder can be recognised. An interrupted sleep, or a more or less incomplete form of wakefulness — states of partial sleeplessness — may occur in consequence of too varied or too anxious states of mental occupation, or of the use of various beverages, or indigestible articles of food, near the period of repose, which prevent the accession of sleep, as green tea, coffee, &c. But when it is not induced by any of these causes, and even when the wakefulness occasioned by them is complete, it should be considered as a most important symptom, and its pathological cause ought to be carefully investigated. *Wakefulness* may be either *partial* or *complete:* the former may be so frequent as to be habitual, or merely occasional; the latter cannot be of long continuance without being followed by dangerous disease.

18. i. *Partial or incomplete sleeplessness* is of frequent occurrence, especially in persons whose minds are much and anxiously engaged, or whose occupations subject them to great mental exertion, or to the vicissitudes of fortune. It may likewise follow the unreasonable indulgence of grief, severe losses of any kind, and the numerous vexations and disappointments of life. When it is continued nightly for a long period, it may superinduce serious disease of the brain, or of the heart, or some other organ, as the cause of the wakefulness may operate upon the frame; the nature of the cause having a more or less special influence upon either the brain, heart, lungs, liver, &c., according to the susceptibility or predisposition of these organs. Partial insomnia is often occasioned by sleeping with too many clothes on the bed, or by the use of curtains to the bed, and to the closeness with which they are drawn, or by an insufficient renewal of the air in the sleeping-chamber. These causes, especially the breathing of an impure or self-contaminated air, induces a febrile state, attended by headache, restlessness, and more or less complete pervigilium, the tongue and mouth being foul and clammy in the morning, and the person unrefreshed, or even much more fatigued and disordered than when repose was sought.

19. Partial sleeplessness has always a most intimate relation to the states of morbid action, and, according to these states, is attended by peculiar features. The sleeplessness may be occasioned, or the sleep may be broken, interrupted, or unsound, by indigestion, flatulence, or acidity of the stomach or bowels, or it may be disturbed by cramps or spasms of various muscles. This association is often observed in gouty and dyspeptic persons: the irritation of the prima via by flatus, acidity, or undigested articles, disorders the ganglionic nerves, and, through the medium of them, disturbs the sleep, excites the brain and spinal chord, the irritation thus extended to these centres being, in some cases, reflected from them to one or more of the muscles of voluntary motion, occasioning spasm or cramp. When wakefulness proceeds from the disordered digestion consequent upon indigestible articles of food, or upon an overloaded stomach, there is not merely more or less restlessness, but also often a feeling of oppression, a disposition to sleep, which, when it takes place, is generally attended by disturbing or fearful dreams, or by the nightmare, the individual waking up in fright, with a dry mouth and excited pulse.

20. When this state of sleeplessness is occasioned by mental exertion, or by continued mental rumination, when retiring to rest, on the subjects which have just before engaged the mind, whether these subjects be abstract or emotional, — whether they be intricate or difficult in their nature, or calculated to perpetuate anxiety or distress, — then feverishness, headache, restlessness, thirst, &c., are apt to occur, and to render sleep, when it at last takes place, unquiet, disturbed by dreams, and unrefreshing. In some cases of this kind, more especially, the person often dreams aloud, and, in rare instances, particularly when there is much nervous susceptibility and mental activity, he *acts his dream,* and evinces a more or less complete state of *somnambulism,* or *sleep-walking.* A youth, whom I knew, was much engaged in becoming an accomplished player on the flute; his dreams had frequent reference to this study, and he often disturbed the family by his performances on this instrument during his sleep. I was called one night to a young lady, who had disturbed and alarmed her relations by walking through more than one of her apartments in her night-dress, singing some songs she had been recently practising. And another young lady, whom I saw on this account, sometimes left her chamber in her sleeping-dress, and sat down to the piano in another room and performed some pieces of music which she had been learning. Females, who are somnambulists, generally first evince this disorder either at the period of puberty, previously to, or about, the accession of the catamenia, or where this discharge is interrupted or otherwise deranged.

21. Persons labouring under disease of the substance or valves of the heart, are subject not only to imperfect and disturbed sleep, but also to fearful dreams; and if they fall asleep in an uneasy position, or on the left side, in some cases, they generally waken up soon after from a fearful dream, as falling from a precipice, drowning, &c.; their dreams being more pleasant when the position is more comfortable. The same phenomena

are often observed in dyspeptic subjects, when the stomach or colon is distended by flatus; for, when the individual lies on the left side, the weight of the body presses on it, whilst the liver presses on the stomach and colon, and the flatulent distension of these pushes the diaphragm upon the heart, and embarrasses the circulation through this organ.

22. There are very few chronic diseases of which partial wakefulness is not a symptom; but it is more especially distressing in atonic gout, rheumatism, affections of the skin, and disorders of the urinary organs. Anomalous states of hysteria, the several forms of dyspepsia, and derangements of the functions of digestion, are, as well as the foregoing, attended by partial wakefulness, or by a disturbed, insufficient, and unrefreshing sleep. Certain beverages and articles of diet may be the chief cause; and when these are relinquished, the sleep becomes more sound. Tea, especially green tea, coffee, and spirituous liquors, often occasion wakefulness; and a full meal of animal food, especially of pork, late in the day, often causes either restlessness, loss of sleep, or disturbing dreams. It would be unprofitable, as it is unnecessary, further to notice the contingent occurrence of want of sleep in chronic diseases, as it is very generally observed and readily accounted for.

23. ii. *Complete sleeplessness* is often a most important symptom of disease, and when it occurs without any manifest physical disorder to account for its existence, it should be viewed as the forerunner of dangerous disease, particularly of the brain. Complete wakefulness, even for many nights, is generally attendant upon nervous and other fevers of a continued type, upon inflammations of the brain, and upon inflammatory affections of an acute character. It also attends the eruptive fevers, rheumatic fevers, the gouty paroxysm, painful and spasmodic maladies, and pestilential distempers. When it is continued for many nights and days, vital power and resistance become exhausted, and delirium, followed by coma, is very apt to supervene. All acute diseases attended by febrile excitement or increased vascular action, especially towards or during the night, are characterised by a more or less complete insomnia; and when the febrile action subsides, then sleep returns, the occurrence of sleep often proving critical of these diseases (see *art.* CRISIS).

24. When insomnia is not followed by sound repose after a long continuance, it often passes into a state of half-sleeping and half-waking, in which the ideas of the patient are rapid, unconnected, and otherwise disordered, and generally expressed aloud, or in a low key. He dreams aloud in this half-conscious condition; or becomes more obviously delirious. The slighter forms of this delirium have usually been called wanderings of the mind; and at first they appear only occasionally, or during the night merely; but when they are not soon followed by composed sleep, are apt to be more continued, more fully developed, and to pass ultimately into sopor or coma.

25. If wakefulness is unattended by any very manifest disorder, or even by slight disorder, or such as appears insufficient to account for it, some serious disease of the brain should be viewed as impending, although a considerable time may elapse before the advent of it. In these cases, the symptoms more especially connected with the nervous systems should be carefully investigated, in connection with the occupation, habits, modes of living, arrangements for sleeping, ventilation, &c. The temperature of the head, action of the carotid arteries, the functions of sense, and those of digestion, assimilation and excretion, ought to be carefully examined, and a treatment, based on the report thereby obtained, should be adopted. A dignitary of the church consulted me for prolonged insomnia. He evinced no other disorder. Palsy, or apoplexy, or coma was dreaded, and the treatment was directed accordingly. He was soon very much better, and continued so for two or three years, during which time I did not see him; but at the termination of it he was seized with apoplexy, at a great distance from London, and died in a few hours. An eminent physician and author was afflicted with insomnia, he afterwards became insane. A patient to whom I was called had long been subject to wakefulness, and was afterwards attacked with phrenitis.

26. Pervigilium is not infrequent *in nervous females, after their confinements,* especially when they breathe a close or impure air, or when they have experienced hæmorrhagic or exhausting discharges. It may pass gradually, or even suddenly, into delirium or mania, if not arrested by an appropriate method of cure. I have been called to several cases of this kind, where the disorder was aggravated by a treatment diametrically opposite to what ought to have been adopted, and which, when adopted, speedily cured the patient. This is a most important affection in the puerperal state, and should, even when attended by no other manifest disorder, receive constant attention, and suggest the most decided and appropriate means of cure, — appropriate, however, to the various circumstances which occasion it, to the several associations in which it is presented to us, and to the maladies of which it is either the precursor or the attendant.

27. Insomnia is sometimes met with in *young and even in older children*: in them it should be viewed either as the precursor of serious disease, or as caused by some latent or undeveloped morbid condition. It not infrequently precedes or attends disease of the membranes or substance of the brain, especially tubercular deposits in the former, or softening of the latter, before serous effusions take place to any considerable amount; or it accompanies the earlier and more latent stages of these lesions.

28. iii. *The treatment of insomnia* should be altogether based upon those *indications of cure* which the disease of which insomnia is symptomatic, or of which it is the precursor, should rationally suggest. It is owing chiefly to a neglect of this principle, that means, directed more particularly to this symptom, either fail of producing their intended effects, or even often greatly aggravate this particular disorder. In all cases of insomnia, attention should be directed to the age, temperament, habit of body, modes of life, and diathesis or morbid tendencies of the patient, before measures should be prescribed for the disorder; and these measures ought to be especially devised against the disease on which the wakefulness depends. A principal indication is to remove the several causes, remote, external, physical, and pathological, which occasion it, more particularly

to correct a close or contaminated air; to reduce the temperature of the apartment, when it is high, and the quantity or warmth of the bed-clothes; to remove all the excitants of the senses; to abstract the mind from all exciting, harassing, or engaging thoughts, and to direct it to such as are uninteresting or unexciting — to one simple unimportant topic; and to remove or counteract the morbid conditions, of which this is a symptom or prominent consequence. In both young and aged subjects, but especially in the dyspeptic and gouty, the accumulations of disordered secretions and excretions, — of fæcal or contaminating matters, — of flatus, of acid or saburral materials, — or a loaded state of the stomach or bowels, are apt to take place, and require free evacuation and correction by laxatives, conjoined with antacids and absorbents. The existence of a plethoric state of the vascular system, or of engorgement of the liver and portal system, should suggest a repeated recourse to purgatives, deobstruents, and alkaline preparations.

29. When there is actual fulness of the cerebral vessels, or cerebral congestion, then local vascular depletions, purgatives, derivatives, the shower-bath, warm stimulating pediluvia, &c., should be prescribed; and, if the insomnia appears to be caused by increased vascular action, or by febrile disturbance towards night, or by augmented determination of blood to the brain, antimonial preparations, or other diaphoretics, conjoined with alkalies, &c., will generally procure sleep, whilst narcotics, exhibited in such cases, would only aggravate the disorder, induce headache, and increase disorder of the digestive functions.

30. Anodynes and narcotics should not be exhibited in cases of either incomplete or prolonged wakefulness, until general plethora or local congestions be removed by the means now suggested, — until morbid secretions, excretions, and fæcal accumulations have been completely evacuated. But they are important means after these ends have been attained, and when this disorder occurs in nervous, hysterical, or irritable temperaments; when it follows copious losses of blood, or exhausting discharges, and when it is thus met with in the puerperal state. In these circumstances, the choice of the agent should depend upon the peculiarities of the case, upon the existence or non-existence of anæmia, and upon the evidence as to the purity or richness of the blood, and as to the actions of the several emunctories. When there is anæmia, or great debility or nervous susceptibility, the preparations of opium, or of hop, or of henbane, or of poppy, with those of iron, or the vegetable bitters and the alkaline sub-carbonates, will generally be of service; but all narcotics in such cases should be given two or three hours before the desired period of their operation, more particularly opiates; and in order to secure their effects, and to prevent headache, sickness, or other disorder in the morning, they should be combined with aromatics and alkalies. In some cases, it may be preferable to administer the narcotic in a suitable enema or suppository; or the odour of it may be inhaled during respiration, by lying with the head on a pillow containing a narcotic substance, as hops, &c.

31. When sleep is disturbed by cramps, nightmare, frightful dreams, &c., the bed should be elevated towards the head, and acidity of the prima via and costiveness ought to be prevented by magnesia, either alone or with sulphur, or with an antimonial preparation; and food should not be taken for several hours before retiring to rest. Persons who are subject to partial wakefulness, or to troublesome dreams, or to sleep-walking, should be submitted to the curative means now advised, adapting these, however, to the peculiarities of each case. Due exercise in the open air, attention to the digestive functions, and a common-sense regulation of the moral manifestations and physical powers, will generally aid the effects of appropriate medical treatment. In all cases, the use of substances or beverages which are liable to disturb the digestive functions, to occasion heartburn or flatulence, or to excite the nervous system, more especially during the advanced hours of the afternoon or evening, the reading of exciting writings late in the evening, and reading in bed, more particularly, should be avoided; and, if wakefulness or disturbed sleep occur in persons who are addicted to these practices, it should, in great measure at least, be attributed to them, and the relinquishment of them ought to be insisted on.

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SMALL-POX. — Synon.—*Euphlogia*, Rhazes; —*Variola*, Sydenham, Boerhaave, Sauvages, &c.; — *Pestis variolosa*; — *Febris variolosa*, Hoffmann, Vogel, &c.; — *Synochus Variola*, Young; — *Synochus variolosus*, Crichton; — *Emphyesis Variola*, Good; —*Petite Vérole*, Fr.; — *Pocken*, *Blattern*, *Kinderblattern*, *Kindspocken*, Germ.; — *Vajuolo*, Ital.; — *Viruela*, Span.; — *The Pox*, Scot.; — *Small-pox*, Engl.

Classif.: — 1st. Class, Febrile Diseases; 3d. *Order*, Eruptive Fevers (*Cullen*). — 3d. Class, Diseases of the Sanguineous Function; 3d. *Order*, Eruptive Fevers (*Good*). — III. Class. III. Order (*Author, in Preface*).

1. Definit. — *Small-pox is the product, and is productive, of a morbid poison or miasm, which, after a period, developes fever, followed by an eruption on the surface of the body, passing through the stages of pimple, vesicle, pustule, and scab, with other concomitant or succeeding affections; the disease running a determinate course, leaving marks in the seats of eruption, and removing from the constitution the susceptibility of another attack.*

2. I. Historical Sketch. — The term *variola* is probably of monkish origin, it being the diminutive of *varus*, a pimple. The term *pock* is of Saxon origin, and signifies a bag or pouch. The epithets *petite* in France, and *small* in England, were added soon after the appearance of syphilis, or the grand or great pox, in Europe, in 1498. In Scotland the word pox is still used without the prefix.

3. Dr. Hahn endeavoured to prove, early in the last century, that the Greeks and Romans were acquainted with small-pox; and, much more recently, Dr. Willan and Dr. Baron have followed in the same track. Rhazes, who was the first accurately to describe this malady, was also the first to refer to the writings of Galen, in proof of its having been known to the Greeks; but, as Dr. Greenhill has shown in his able notes to his admirable translation of Rhazes, the ἴονθος of Galen was not small-pox, but the *acne* of modern authors. Mr. Moore has striven to show that small-pox was known in China and Hindostan, even before the time of Hippocrates. Dr. Gregory remarks, that he is incredulous of this having been the fact, and that he "is borne out in this scepticism by the opinions of Dr. Friend, Dr. Mead, and many other physicians of great learning, and equally indefatigable in research." It is not, however, improbable, that the disease may have appeared or prevailed in China and other adjoining countries very long before it was known in Arabia or Syria, and that it may have taken even a much longer period to have extended from the former to the latter countries than it took to reach the western parts of Europe.

4. That small-pox was not known to either Greek or Arabian writers early in the 6th century, is manifest from the circumstance of no mention having been made of it in the work of Alexander Trallianus, in which all the diseases then known are briefly described. Dr. Gregory, in his very excellent work on "Eruptive Fevers," remarks, that "the first notice of a disease which looks like small-pox, is to be found in a chapter of Procopius, 'De Bello Persico' (lib. ii. c. 22.), where he describes a dreadful pestilence which began at Pelusium in Egypt, about the year 544." But I cannot agree with this view; for Procopius states that malady to have been attended by buboes and carbuncles, which, with the other particulars mentioned by him, point rather to the plague than to small-pox. Dr. Gregory, however, adds, that whether this "disease was small-pox or not may be doubted; but certainly within a short time afterwards very unequivocal traces of small-pox are to be met with in the countries bordering on the Red Sea, for we read of caliphs and caliph's daughters being pitted." (*Op. Cit.*, p. 35.)

5. It cannot be doubted that small-pox had prevailed and been well known in Arabian and adjoining countries, and even in the western parts of Europe, some centuries before Rhazes described it at the commencement of the 10th century; and probably it was even much earlier known in China, or in some eastern countries, than in these. Mr. Bruce, the celebrated traveller, believed that the first epidemic of small-pox of which any notice can be found, occurred in 522. Mead says that, according to an Arabian manuscript, in the library of Leyden, this malady appeared for the first time in 572, the year of the birth of Mahomet, in Arabia, where it was introduced by an Abyssinian army. Marius, bishop of Avenches, remarks in the second volume of his "*Historia Francorum Scriptorum*," &c., that it existed in Europe two years before this date, and that it ravaged France and Italy. Marius, who sat in the second council of Maçon, held in 585, states positively, in his chronicle, that in 570, "*morbus validus cum profluvio ventris et variolis, Italiam Galliamque valde afflixit;*" that it ceased for some years, and reappeared in 580 in the same form as in 570. He adds, that Dagobert and Clodobert, sons of king Chilperic and Fredegonda, died of this malady; that the wife of Gontran, king of Burgundy, was also attacked in 580, and that, feeling her dissolution near, she accused her two physicians, Nicolas and Donat, of having poisoned her, and requested their execution, which was carried into effect over her tomb.

6. M. Monfalcon states, that Ahron, a physician of Alexandria, at the commencement of the 7th century, first mentioned the symptoms, the different varieties, and the treatment of small-pox; and that, in 640, during the reign of the caliph Omar, when the irruption of the Arabs or Saracens into Egypt took place, the disease appeared in so destructive a manner, as to lead many contemporary writers to suppose that it was a new pestilence. It appears to have extended during the 7th century to all the countries whither the Saracenic conquerors carried their arms.

7. Although Rhazes was the first to write expressly and fully on small-pox, he does not pretend to have been the first who had noticed it, for he gives extracts from the works of Ahron, the elder Mesue, and the elder Serapion, in which mention is made of it. This malady was afterwards noticed by Avicenna, Hali-Abbas, and other Arabian authors. It appears to have reached England towards the close of the 9th century, or even earlier. After or during the Crusades, the spread of the malady appeared more extended. It then prevailed in most of the temperate countries of Europe. Bernard Gordon, professor of medicine at Montpellier, in 1285, notices the frequency and fatality of the disease in France at that time; but it does not appear to have been so early known in Norway, Lapland, and other very northern countries; the coldness and dryness of the air probably retarding its progress to them. Dr. Gregory states that the word Variola is to be found in several Latin manuscripts in the British Museum of dates decidedly prior to 900. It should not be overlooked that the contagious nature of small-pox was admitted by all the Arabian and other early writers.

8. From Europe, small-pox was carried across the Atlantic to Mexico, which it devastated in 1527, and spread from thence, with fearful virulence, throughout the American continent. The ravages of small-pox were especially great within the tropics, and still are most remarkably so in the dark-skinned races, as sufficiently demonstrated to my own observation. From the earliest notices of the malady, until the appearance of the writings of Sydenham, there is little to mention in the history of its progress, prevalences, or treatment, further than that it was the most generally diffused, the most frequently epidemic, the most fatal, and the worst treated, of all known pesti-

lences. The heating or sweating regimen had gradually reached its acme when SYDENHAM appeared. He not only accurately described this disease, but distinguished it from measles, and reformed the treatment of it. BOERHAAVE and VAN SWIETEN adopted and carried out the views of SYDENHAM, and demonstrated the extension of the malady by means of a specific miasm or virus alone.

9. The *inoculation*, or artificial production, of the disease was then only brought into notice in Europe, although it had been practised in various countries for ages previously. We have no information as to the period when this resource was first adopted, or as to the circumstances which suggested it. It is by no means improbable, that the well-known contagious nature of small-pox, the greater severity of the disease in childhood and infancy than in adult age, the admitted liability of all to be infected, the immunity from a second attack, and the desire generally felt of having what was inevitable undergone as early in life as possible, may have suggested to those exercising the healing art the experiment of artificially communicating the disease, when prevailing in a mild form, to children and those exposed to its infection, in order to secure an immunity from it in after-life; and it is equally probable that those considerations influenced many in more countries than one, and at different eras. The obvious advantages which resulted must have led to the diffusion and the continuance of the practice. VOLTAIRE, writing as early as 1727 in favour of inoculation, remarks, that the females of Circassia and Georgia were, from times immemorial, in the habit of communicating the small-pox to their children at as early an age as six months, by making an incision in the arm, and by inserting in this incision the contents of a pustule taken from another child. M. MONFALCON states, that inoculation was practised from remote antiquity in Africa, especially on the coasts of Barbary, in China, Hindostan, Egypt, Armenia, Tartary, in Greece, and even in Wales and some parts of the west of England, and in Auvergne and Perigord in France. He does not, however, give the authorities for this statement. BARTHOLIN, who wrote about the middle of the 17th century, states that inoculation had been long used in some parts of Denmark. MONFALCON remarks, that it was employed for the first time in Constantinople in 1673, and BRUCE, the celebrated traveller, says that it had been practised for ages in Nubia. Dr. E. TIMONI, Mr. KENNEDY, and Dr. PYLARINI, in 1714 and 1715, made the profession in England acquainted with it, but no attention was paid to it, until Lady MARY WORTLEY MONTAGUE had her son inoculated at Constantinople in 1717, and her daughter in 1721 in England. After successful trials upon six condemned criminals in Newgate, the Princess of Wales submitted successfully her own daughters to the new process in 1722. VOLTAIRE, in 1727, was the first writer in France to direct popular opinion in favour of inoculation. His observations on the subject may even now be read with interest. He remarks, that most of the 20,000 who died of small-pox in Paris in 1720, would have been saved if inoculation had been then introduced.

10. The first ten years of the career of inoculation in this country, Dr. GREGORY observes, were singularly unfortunate. It fell into bad hands; it was tried on the worst possible subjects, and practised in the most injudicious manner. The consequence was that it soon fell into disrepute. The pulpit, too, sounded the alarm; and conducted as inoculation then was, it was a questionable improvement. A new era in this practice arose in 1746. The Small-pox Hospital was founded for the extension of inoculation among the poor. In 1754, the College of Physicians put forth a strong recommendation of the practice, and MEAD and DE LA CONDAMINE wrote treatises in favour of it. In 1763, the practice was especially adopted by Mr. R. SUTTON and his two sons, who inoculated with great skill and success. "In 1775, a dispensary was opened in London for the gratuitous inoculation of the poor at their own houses; but the institution failed, chiefly through the opposition of Mr. DIMSDALE, who had succeeded the SUTTONS, and fully equalled them in popularity and success. The Small-pox Hospital then took up the plan of promiscuous inoculation, which was carried on, to an immense extent, between the years 1790 and 1800. In 1798, Dr. JENNER announced the discovery of vaccination. In May, 1808, the inoculation of out-patients was discontinued at the Small-pox Hospital. In June, 1822, inoculation was discontinued to in-patients. On the 23d July, 1840, the practice of inoculation, the introduction of which has conferred immortality on the name of Lady MARY W. MONTAGUE, which had been sanctioned by the College of Physicians, which had saved the lives of many thousands during the greater part of the preceding century, was declared illegal by the English parliament. All offenders were to be sent to prison; and it was even provided that any attempt to produce small-pox by inoculation, even though unsuccessful, including, of course, the testing of vaccinated subjects, was an offence at law." (*Op. Cit.*, p. 39.)

11. II. DESCRIPTION OF NATURAL SMALL-POX. — This malady presents several forms, depending chiefly on its grades of severity, these grades arising from the intensity or concentration of the infecting miasm; from the susceptibility, constitution, or habit of body, of the person infected; and from the extent to which vital organs or surfaces are affected by the morbid actions developed by the morbific leaven. The state of the eruption more especially fixes our attention, inasmuch as it disorders the functions of an important organ, as it is a suppurative inflammation of a surface which induces serious sympathies in the œconomy, as it is an indication of the state and character of the vital powers, of the vascular action, and even of the blood itself; and as it most visibly and tangibly manifests the form or variety of the disease, suggesting not merely the diagnosis and prognosis, but also the indications of cure. As respects the *eruption*, therefore, it may be *distinct*, *corymbose*, *semi-confluent*, or *confluent*, according to the number, grouping, or distribution of the pustules; it may also be superficial, cellular, limited to the cutaneous surface, or extended more or less to the mucous membranes, especially at the outlets of canals; it may, moreover, be papular, vesicular, pustular, ichorous, scorbutic, or sanious, or purplish, or even blackish, according to the changes taking place in it. As regards the *type* or *character* of the attendant fever, small-pox may

be *benignant, synochoid, petechial, malignant* or *putro-adynamic*. It may also be *simple* throughout its course, and it may be more or less *complicated*, or associated with a prominent affection of one or more important internal parts or vital organs, developed during the progress of the malady. As will be rendered more apparent in the sequel, there is in general an intimate dependence of the state and appearance of the eruption upon the type and character of the fever, and of this latter upon the organic functions and the conditions of the blood. Whatever may be the form which the disease may assume, or however varied the associations of the states now enumerated may appear, small-pox presents certain stages which more particularly mark its course. These stagse have been divided into, 1st., that of incubation; 2d., that of invasion; 3d., that of eruption; 4th. that of suppuration; and 5th, that of exsiccation, But some authors have distinguished only three, namely, 1st., incubation; 2d., maturation, and 3d., decline. The stages may be divided into, 1st., the *latent, precursory*, or *incubative;* 2d., the *febrile*, or *the primary fever;* 3d., the *period of eruption and development;* 4th, the *maturative* or *suppurative stage*, or the *period of secondary fever, desiccation, and decline.*

12. i. DISTINCT, BENIGN, or SIMPLE SMALL-POX. — This form of the disease is very frequently met with in healthy constitutions, favoured by a pure air. It was that most frequently produced by inoculation, when this mode of communicating the disease was permitted. Between it, however, and the confluent, no very precise demarcation can be assigned, as the corymbose and the semi-confluent are mere approaches to this more severe form. In the distinct or benign states of small-pox, there is no serious depression of the vital power, or contamination of the fluids or solids, or dangerous affection of internal or vital organs, which more or less prominently mark the confluent and typhoid forms of the malady. The distinct small-pox presents in general the regular procession of the stages just distinguished,

13. *A. The period of latency* or *incubation*, — the *precursory stage*, — in small-pox, or the time which elapses from the inhalation of the infecting miasm, or the morbific leaven, until the appearance of the primary fever has been ascertained with considerable precision on numerous occasions. In cases of inoculation, the duration of the stage is rendered apparent. But in natural small-pox it is very commonly a matter of doubt. Dr. GREGORY, who has directed his attention to this topic, states that a large accumulation of facts enables him to fix this period at about twelve days, and that the extremes may be stated at ten and sixteen days. It has been, however, contended by several writers, that circumstances may occasion much longer or much shorter periods of incubation than are here assigned; and my own observation tends to confirm this opinion. A concentrated effluvium or miasm from the infected; a severe and prevalent epidemic; a very susceptible, weak, or cachectic habit of body; great fear of the disease, or dread of infection; a warm, humid, and close atmosphere; and the respiration of air, loaded with emanations from a number of small-pox cases, may somewhat shorten this period, and hasten the next or eruptive. On the other hand, various circumstances may prolong this stage, and retard the appearance of the next, especially a weak dose of the poison; strong health and insusceptibility of the patient; a dry, cold, and pure state of the air, or residence in a dry and bracing locality. In the former circumstances, the period of incubation may possibly be shortened to seven or eight days, and in the latter it may be prolonged even to twenty or twenty-one days; but of these extreme ranges Dr. GREGORY very strongly doubts, ten and sixteen days being the extremes according to his observation. The inoculated disease furnishes a more determinate duration, which is generally from seven to nine days.

14. The first days of this period are often passed without much, or obvious disorder; but, in other cases, some symptoms are experienced indicating a state of impaired health, especially languor, lassitude, or malaise. When the disease is infected by a miasm floating in the air, or emanating from the sick, the patient sometimes experiences, at the time, an unpleasant and peculiar odour, generally attended by a feeling of sickness, giddiness, and of impending disease. When this feeling is strong, it is often accompanied by a state of alarm or dread, which seems to shorten this stage and to hasten on the next, and even to render the malady more severe.

15. *B. The febrile stage, or that of invasion — the primary fever*, — supervenes upon the preceding period; or from the ninth to the thirteenth day from the time of infection, or from the seventh or eighth day from inoculation, the patient experiences rigors, followed or attended by febrile symptoms, especially acceleration of pulse, heat of skin, pains in the loins and limbs, restlessness, scanty and high-coloured urine, nausea, vomiting, &c., &c. In some cases, the *rigors* and *heats* alternate for some time, or during the first day; but the latter generally soon follow on the former. On the second day the fever is attended by *nausea* and *vomiting*, and great depression, with tenderness at the epigastrium on pressure, and anxiety at the præcordia. The lassitude and torpor are often accompanied, in adults, with somnolency, headache and sweats; and in children, with faintness, sinking, or even with convulsions, or eclampsia. *Pain* throughout the body, more especially in the head, back, loins, and limbs, is always experienced, and the pain at the epigastrium is often so severe as not to admit of the least pressure, or even the weight of the bedclothes. In some cases, the headache is attended by stupor or delirium, especially in adults; and in children, by sopor, or epileptic convulsions; in these, the face is hot and flushed, and the carotid and temporal arteries beat strongly, the *tout-ensemble* of the symptoms indicating great vascular reaction. SYDENHAM remarks that, when children, especially after dentition, are seized with convulsions during the primary fever it is a sign of the speedy appearance of the eruption; so that supposing the convulsions to take place over night, a kindly small-pox may be expected to appear in the morning.

16. In other cases, excessive prostration, with faintness or syncope, extreme anxiety at the præcordia, oppression at the chest, frequent sighing, and even dyspnœa, pallid countenance, coldness of the extremities, and feeble pulse, usher in the febrile stage, and take the place of rigors or chills, or follow immediately upon them. These symptoms are indications of the depressing influence of the

poisonous miasm on the organic functions, and of the inability of the vital energies to react sufficiently, or to develope a state of healthy action. In these cases, a confluent state of the disease, or marked adynamia may be expected, with pulmonary congestion, &c. One or other of the foregoing groups of symptoms generally usher in the eruptive fever, and although neither of them can be considered as evidence of the nature of the incipient malady, still, the previous good health of the patient, the suddenness or severity of the seizure, the prevalence of variola in the vicinity, or prior exposure to infection, even although vaccination or previous small-pox should have been undergone, ought to be viewed as very strong indications of the disease. Dr. Gregory justly remarks, that the fact of prior vaccination should not throw the physician off his guard, for the initiatory fever is just as severe after vaccination as it is in the unvaccinated.

17. *C. The period of eruption and development.* — Forty-eight hours elapse from the rigors to the first appearance of eruption. The period is never less, but it may be protracted by weakness of constitution to seventy-two hours, and the full development of the eruption over the whole surface, may even occupy three days. Generally, however, the eruption appears on the third or fourth day of the fever. During this fever, besides the more prominent symptoms above mentioned, stridor of the teeth in children, with sopor, is very common; and in adults, a peculiar and fœtid odour, with sleeplessness, dryness of the fauces, and turbid state of the urine. The pulse is much increased in frequency, and is either soft, or broad and compressible. The febrile symptoms more or less abate in the morning, and increase towards evening.

18. Minute papulæ, sensibly elevated above the general surface, or plane of the skin, show themselves, at first on the face, forehead, and wrists, especially on the sides of the nose, upper lip and chin; then on the neck and breast, and afterwards, on the limbs and trunk. When the papulæ are numerous, their first appearance is attended by tension and slight pruritus; and, upon moving the fingers over the skin with some firmness, the papulæ are felt to be not merely superficial, but based in the cutis vera. The eruption rarely commences in the lower extremities. Sometimes two or three large papulæ precede the general eruption, and advance to the state of vesicle, before the surface is extensively occupied. The papulæ are "generally not thrown together confusedly and without order, but are arranged in groups of three or five. Crescents and circles may be traced very distinctly, when the eruption is not too copious. This constitutes an important diagnostic between variola and varicella." In most cases, the eruption affords great relief to the general constitutional disturbance. The fever abates, the sickness subsides, and the pains of the head, loins, and limbs moderate, or altogether cease.

19. *The development* of the papulæ commences with the evolution of the eruption and the subsidence of the fever, which precedes and evolves the eruption. But during this period, although the fever abates, more or less remarkably, especially in the benign, or distinct form of the distemper, yet it rarely ceases altogether, or disappears without returning more or less slightly in the evening. When the eruption is abundant, or the temperament of the patient is irritable or sanguineous, the mitigation of the fever is less remarkable; and, if the eruption has been delayed, or is confluent, or if the disease be complicated by some internal congestion or prominent affection, the febrile action may be continued during the development and maturation of the eruption with but little abatement, and generally in a typhoid, adynamic or even putro-adynamic form or type.

20. The number of the pustules vary according to the severity of the case — from three or four to some thousands, appearing first on the face, neck and upper extremities, then on the trunk, and lastly on the lower extremities, and changing from the state of papulæ, or vari, to that of vesicle and of pustule in succession. When the eruption is fully out over the body, and the pustules on the face begin to maturate, or about the eighth day from the commencement of the eruptive fever, the whole face, head, and neck become somewhat swollen, particularly the eyelids, which are often so distended as to close the eyes; and the swollen parts are painful when touched, and even throb. This intumescence lasts about three days, the spaces between the pustules appearing inflamed, or of a deep red, or damask rose colour: the closer this resemblance, the milder, generally, is the subsequent disease. Nearly one fifth of the number of pustules appear on the face; and according to Sydenham, the danger is in proportion to the number of pustules on the face, those on the other parts of the body hardly influencing the event. This, however, is not altogether the case, for the danger chiefly arises from the *tertiary* effects of the poison, or those produced upon vital or internal parts; the *secondary* effects being the cutaneous eruption.

21. *D. The suppurative or maturative stage, — the period of secondary fever and desiccation.* — With the intumescence of the face, the fever, which had remitted, returns, and the secondary fever commences. In cases of ordinary severity, the return of the fever is marked by a considerable increase of heat of surface, by a frequent pulse, and by slight delirium, from which the patient is easily roused. In favourable cases, the swelling of the face, the redness of the intervening spaces, and the secondary fever, having continued from the eighth to the eleventh day, subside, and the pustules, now fully ripe, burst and discharge a thin yellow matter, which concretes into crusts that fall off on the fourteenth or fifteenth day from the commencement of rigors, and the disease terminates, leaving the surface underneath the crusts depressed and of a pale lake colour. If the disease be of greater severity, hæmaturia, hæmoptysis, oppression in the chest, or a hard dry cough, may be complained of, with severe headache or pains in the loins or limbs, and more marked delirium, or even sopor; these more severe symptoms, however, generally subsiding on the eleventh or twelfth day.

22. When the symptoms assume an unfavourable aspect or threaten a fatal issue, then the face, which ought to have been intumescent on the eighth day, remains without any fulness or swelling; and the spaces between the pustules, instead of being red or inflamed, as seen in the favourable cases, are pale and white. Sydenham says that

the pustules look red and continue elevated even after death; and the sweat, which was free up to this day, suddenly ceases. At this critical period, the secondary fever, instead of presenting more or less of a sthenic character, may assume either a typhoid or an asthenic or a sinking form. When the secondary fever presents a typhoid type, the tongue becomes brown and dry, the pulse very frequent, and delirium soon appears, and often quickly passes into sopor or coma. In the rapidly sinking form, the patient may appear as suddenly overwhelmed by the depressing influence of the morbid poison, the pulse being hardly increased in frequency, the heat of the body natural, and the intellect unimpaired. Dr. R. Williams remarks, that the first case he saw of this kind, he could not help assuring the patient "that his symptoms were favourable; but he shook his head, and, perhaps from an inward feeling that his fate was sealed, affirmed that to survive were impossible, and he died a few hours afterwards." (*On Morbid Poisons*, p. 228.) Such cases are, however, rare in the discrete small-pox, but they are much more frequent in the confluent (see §§ 33. *et seq.*), and result from the influence of the poisoned and contaminated blood on the organic nervous system and heart. These cases very closely resemble, in all respects excepting the eruption, the character and termination of the putro-adynamic form of *fever* (which see §§ 472. *et seq.*).

23. In the more severe cases of the discrete or distinct small-pox, the morbid poison acts not only on the skin, but also on the mucous membrane of the eyes, throat, and mouth, occasioning an eruption, often somewhat pustular, in these parts. This additional affection does not appear to aggravate the fever, at least not materially, but it occasions more or less inconvenience. The eruption in the mouth and throat causes hoarseness, soreness of throat, and difficulty of swallowing. When the eruption extends to the conjunctiva or cornea it is often not attended by much pain; but when the swelling of the eyelids has subsided, the extent of mischief which sometimes takes place, especially when the cornea is implicated, is then discovered. The mucous surfaces are, however, not so much or so generally affected in the discrete as in the confluent form of the distemper (§§ 39. *et seq.*).

24. At this period a peculiar faint and sickly odour, particularly when the eruption is copious, emanates from the patient. Sometimes, especially in females and persons of a delicate and scrofulous habit of body, the secondary fever is accompanied with a very tender state of the general surface; but it is a very favourable sign. Recovery may be retarded by weakness of habit, by cold, and by the presence or development of the scrofulous taint. An ecthymatous eruption may also occupy the surface, or the skin may be left dry and scaly, or the scabs may be adherent. These phenomena are chiefly owing to the form of secondary fever, in connection with the habit of body, &c.

25. *E. Of the progress and appearance of the discrete eruption.* — The affection of the skin being generally present, whilst that of the mucous membranes is often wanting, especially in milder cases, the cutaneous eruption requires especial attention. The *eruption* runs a course of eleven or twelve days, in discrete small-pox, from the very first appearance of it until its termination; and, in its progress, is at first tubercular or papular, then vesicular, afterwards pustular, and lastly, it scabs and falls off. The first, or papular, lasts about two days; the second, or vesicular, occupies four days; the third, or pustular, or suppurative, lasts three days; and the desiccative lasts three days more. The form and progress of the eruption is different in the confluent, in the verrucose small-pox, and in variola after vaccination. The eruption at first consists of a number of minute pimples or papulæ, which feel like minute tubercles in the true skin, when the fingers glide firmly over the surface, and are about the size of a pin's head. They are more or less numerous, but distinct from one another, and hardly salient. On the third, or close of the second day, a minute vesicle forms on the apex of each pimple or papula, which, as it fills, is bound down or depressed in its centre, or umbilicated, and contains a clear whey-coloured fluid. On the approach of suppuration or maturation, the cuticle covering the vesicle loses its transparency, and becomes white and opaque. About the fourth or fifth day of the eruption, a red areola appears around the base of each vesicle, and, shortly afterwards, the central *bride*, causing the umbilication of the vesicle, ruptures, and the vesicle becomes pustular, enlarges, and fills, and assumes a somewhat conical or acuminated form. From the fifth to the eighth day of the eruption, the pustule maturates, when the surface becomes rough and yellow, and the cuticle breaking, allows a portion of the contents to ooze out. In the interval from the eighth till the eleventh day, the pustule secretes the peculiar viscid matter which concretes and forms the scab. This scab desiccates, and is detached between the eleventh and fourteenth day, leaving the cutis, which it covered, of a reddish brown, which lasts many weeks; but if the pustule has so penetrated, as to cause ulceration of the rete mucosum, it leaves a permanent depression or pit. The cicatrix which is formed after these burrowing pustules is usually white.

26. *F. The internal structure of the variolous pimple and pustule* has attracted the attention, first, of Cotugno in Italy, and afterwards of John Hunter, Adams, Bousquet, Gendrin, Judd, Petzholdt, and others. Dr. Gregory has given the following account of the organisation of the variolous pustule: — "Inflammation begins at the spot called the phlyctidium. In seat is in the cutis vera. From the central point, or stigma, the inflammatory action proceeds by radiation to the surface, penetrating to a greater or less depth in different cases. Beneath the epidermis, and constituting the greater part of the phlyctidium, is formed a substance or disc, of the consistence of pulp or thick mucus. This is not considered as any part of the skin altered by disease, but as a product of a specific action of the vessels. John Hunter and Adams called it the variolous slough. At the height of suppuration this substance is swollen, and moist like a sponge. The floor of each phlyctidium presents the papillated structure of the skin, elevated and marked with fissures. The vesicle is divided, like the substance of an orange or poppy-head, into numerous cells — twelve or more. It is multilocular. A filament of cellular tissue binds down the central portion of cuticle to the lower surface of the phlyctidium, and gives to the vesicle, in its early stages, that umbilicated form — that de-

pression of its centre which, though not peculiar to the variolous eruption, is so striking a diagnostic mark between it and genuine varicella. The fluids, lymph and pus, which at different periods distend its cells, destroy at length the filamentous attachment of the stigma to the cuticle, and that which was at first a depressed or umbilicated vesicle becomes at last an acuminated pustule. It bursts, discharging a well-formed purulent matter, of a yellowish colour and creamy consistence."*

27. The inflammation of the phlyctidium is attended by a specific or erythematous inflammation, called the areola, extending to some distance beyond the margin of the vesicle. The exact tint of this areola should always be carefully noted as indicative of important local and constitutional states. On the subsidence of this inflammatory areola, the ripened pustules, having burst and discharged their contents, are succeeded by scabs, which dry up and fall off, in a healthy constitution, in four or five days. In very mild cases, when the process of pustulation is not fully gone through, many of the vesicles shrivel, and form only imperfect, scaly crusts. On the lower extremities, this premature desiccation of the vesicles is often very general.

28. In severe cases, the inflammation of the corion does not cease with the completion of the pustulating process. Portions of the cutis vera are then actually destroyed and slough away, the skin presenting the appearance of pits or fossæ, with a clarety hue, when cicatrization is at length completed. The dark tint wears off in the course of three or four months, but the depressions are permanent. From the great vascularity of the face, and from the exposure of it to light and air during the progress of the eruption there is always a more severe effect and disfigurement produced by the disease in this situation, than in any other part of the surface of the body.

29. ii. MODIFICATIONS OF DISCRETE OR BENIGN SMALL-POX. — *A. Verrucose Small-pox — Variola verrucosa. — V. cornea. — Horn-pock, &c.* This mild, mitigated, or modified form was well described by VAN SWIETEN. Its symptoms are similar to those of the preceding form, but are much milder. The primary fever is often little more than a febricula, and the pustules seldom exceed one or two hundred. These, indeed, seldom reach a pustular state, but, having passed through that of tubercle or papula into that of vesicle, on the sixth day, or even sooner, desiccate, shrivel up, and crust. This form is so mild, that the secondary fever is not manifested, and consequently is wanting; convalescence commencing on the eighth day of the eruption.

30. *B. Variola discreta siliquosa.*—When there are empty vesicles between the pustular pimples, or when the pus of the pustular pimples has been absorbed, so that they are left empty, the disease has been named *discrete siliquose small-pox.* When the eruption continues *vesicular*, instead of being pustular, the disease has been called *discrete crystalline small-pox.* When vesicular pimples appear in the interstices between the pustules, this modification has been named *discrete vesicular small-pox.* In these varieties the symptoms are generally mild, and the eruptive fever generally slight or moderate, and the secondary fever is either wanting or mild; the duration of the disease being rarely prolonged, but often somewhat shortened.

31. *C. Small-pox without the eruption.—Variola sine Eruptione.*—Variola presents, in the more severe cases, the fever, the cutaneous eruption, the affection of the mucous membranes, and the internal complications, hereafter to be described. In the more mild or benign cases, it consists only of the fever and the eruption; but, in both classes of cases, there is a *primary* and *secondary* fever. In small-pox the fever is remarkable, and distinguished from all other fevers by its remission at the end of four days, or when the eruption has come out, and by its return after a remission of four days, or about the end of the eighth day in the discrete, and about the eleventh day in the confluent small-pox. But cases sometimes occur, especially where the pustules are few, or their maturation is rapid or abridged, in which the secondary fever is either very slight or altogether wanting; and other cases are met with, much more rarely, where neither the eruption, nor the secondary fever, is detected; and yet there can be no doubt of infection having taken place, and of the system being protected from another attack. In those, however, the primary fever has

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* The following descriptions further illustrate this topic: — BOUSQUET says that the pustule has its seat in the true skin, and that the epidermis is not thickened. On removing, however, the epidermis, which is easily detached, we discover a white, opaque, smooth surface, which is a layer of lymph deposited from its adherent surface, and on removing this "disc," the interior of the pustule is seen divided by many concentric radii into a number of divisions or cells, each filled with fluid, but not communicating. This interior arrangement, BOUSQUET compares to a cut orange, or pomegranate, while Gendrin says, it resembles that of a spice box. The depression at the centre on the *umbilication* is occasioned by a portion of cellular tissue which binds down the cuticle, and is slow to undergo the process of ramollissement by which it ultimately ruptures. The description of the pustule by Mr. JUDD, who appears to have examined the formation of the small-pox pustule with great care, is, in some respects, different. For he states, "that in the small-pox pustule, circles of vessels enlarge and project from the cutis vera, and they secrete a thin serum, which gradually raises a ring of the cuticula externa from the rete mucosum, and distending it, forms a vesicle, without, except in some violent confluent cases, breaking up the attachment in the centre between the cutis rete and the cuticle. Hence the vesicle is bound down at that spot, and hence it has a depressed summit. The degree of inflammation suddenly increases, and a thick coagulable lymph is then thrown out that at once consolidates, and forms a thin flat plate like a cymbal, but with a small hole left through its centre, from the coagulation taking place around the before-mentioned thread-like attachment of the cuticle. Now, about the time when the fever and inflammation are again increased, called the secondary fever, and pus being secreted, it elevates the lately described cymbal, or plate, and causes it to divide the pustule horizontally, into an upper and lower cell, and the progressive distension at times breaks up the remaining attachment between the cuticle and cutis. The pustules become opaque; for the pus passes through the hole in the plate, or septum, and blends with the lymph or serum above. The lower part of the pustule is completed by an extremely thickened state of the rete mucosum, which forms a raised lip or cup around; and, in most instances, the pustule may be stripped off with the cuticle and rete, still leaving the cutis entire. But the cutis vera has frequently a slight depression left from ulceration at the base of the cup, and occasionally a papule of the cutis projects into its centre, to which the band of attachment from the cuticle still adheres.

"After the incrustation has separated, and the eruption is gone, a stain with a depression, is commonly left in the centre of the rete mucosum, occasioned by a zone of red vessels remaining long distended, both in the Ethiopean and in the European. In the former it is black and permanent, except when the cutis vera has been penetrated; whilst in the latter the marks are red and transitory, unless, indeed, when ulceration has penetrated the cutis, in which case, in them, also, the pits are white and permanent in the European."

taken place, but without inducing the usual eruption. Sydenham, Lentin, Pelargus, Dubousis, Du Bourg, Frank, and others have observed, during the epidemic prevalence of small-pox, that some few persons who have not previously had the disease, nor been vaccinated, have been seized with all the symptoms of the primary variolous fever, and which having subsided without any eruption having appeared, they have afterwards been found unsusceptible of the disease.

32. Sydenham, De Violante, Crosse, and some other writers above referred to, have remarked that cases have occurred, during the periods when small-pox was raging, which have been attended by petechiæ, bloody-urine, or by purple spots and low fever, and have terminated fatally. These cases were viewed by them as small-pox without the eruption the severity of the internal complication, or the state of the habit of body and of constitutional powers preventing the due and regular evolution of the disease on the surface. It is by no means unreasonable to suppose, that analogous phenomena to those which I have described in respect of *scarlet fever* (see that disease § 26. *et seq.*), may also occur during the prevalence of epidemic small-pox; and that, owing to a predominant affection of the kidneys, or to depressed vital power, the eruption is either not developed on the surface, or very imperfectly, or in such manner as remarked by these and other writers. In cases where the kidneys are thus severely and early implicated, especially so as to arrest their excreting functions, not only are the usual phenomena and progress of the distemper interrupted, but a fatal issue soon takes place.

33. iii. Symptoms of Confluent Small-pox. —This state of the distemper commences generally with symptoms similar to those of the distinct variola, but more severe. The primary fever is usually attended by more sickness and vomiting; by severe pain in the loins, head, and limbs; by greater heat of surface; by more considerable and continued delirium; and, in children, especially in the evening, or just before the eruption, by eclampsia or convulsions. The fever is not only more intense than in the discrete variola, but it is also of shorter duration; the eruption appearing somewhat earlier, or generally on the third day, sometimes at the end of forty-eight hours from the rigors, but rarely later than the third day. The sooner the eruption appears, the more confluent, generally, does it become. Sometimes it is preceded by extensive erythematous inflammation, and the papulæ come out irregularly, or in small clusters, or resemble the measles, and are more prominent than in the distinct variola.

34. The eruption is followed by a less complete remission of the primary fever than in the discrete small-pox, the pulse continuing frequent and soft, the tongue white, and the skin more or less hot, especially in the evening or night, when, also, delirium often recurs. Salivation, which seldom is seen in the distinct, excepting in the more severe cases of that form, very generally occurs in the third stage of the confluent distemper — during the period of development, beginning either with the eruption, or a day or two afterwards. The salivary discharge is at first thin and abundant, resembling that produced by mercury; but it becomes thick and viscid about the eighth day of the eruption; and, in very severe cases, it either ceases for a day or two and then returns, or it disappears altogether. Adults are more liable to salivation than children; but diarrhœa more frequently occurs in the latter, and often becomes profuse, or continues during the disease. The eruption is more or less modified in the confluent distemper; for the pustules, especially those on the face, do not rise, and are more irregular and flatter in their forms than in the discrete form. Owing to their greater number and contiguity, they run into each other and become confluent; sometimes forming irregular blisters or bullæ, varying from the diameter of a fourpence or sixpence to that of a half-crown.

35. These symptoms may not vary materially until the eighth day of the eruption, or eleventh of the fever, when the stage of secondary fever commences, and greatly increases the severity of symptoms and danger of the malady. Previous to this period, the confluent malady seldom endangers life unless hæmaturia, or suppression of urine, or hæmoptoë, or congestive pneumonia, or general bronchitis, &c., supervene, or the character of the pustules, or other signs, indicates a very contaminated state of the circulation. On and after the eleventh day, especially on that day; and on the fourteenth, the seventeenth, or the twenty-first day, according to Sydenham and R. Williams, the patient is often brought to such an extremity, that it is equally uncertain whether he may live or die. He is first endangered on the eleventh day by a high fever, attended by great restlessness or delirium, or by other symptoms, which usually prove fatal unless controlled or prevented by treatment. If he outlive this day, the fourteenth and seventeenth are to be dreaded, for distressing restlessness, with more or less of the unfavourable symptoms about to be noticed, are liable to come on, or to become aggravated, between the eleventh and fourteenth days, and to place him in the most imminent jeopardy.

36. The most dangerous symptoms in the advanced stage of the distemper, or appearing with or during the secondary fever, are, the absence of the usual redness in the intermediate spaces; the non-intumescence of the face; the distribution of petechiæ in the interstices, or a black spot, hardly so large as a pin's head, in the centre of each pustule, or the partial filling of the pustules with a dark ichorous matter, or a disposition to gangrene in the larger vesicles; suppression of the salivation; cough, with hæmoptoë; suppression of urine, or hæmaturia; the signs of congestive pneumonia or bronchitis on percussion and auscultation, more especially if attended by lividity of the lips, face, or extremities, indicating the affection of both lungs, which is generally the case; a brown or dry tongue; great restlessness, or a continued delirium, coma, or sopor; unconscious evacuations; exudations of a dark or ichorous blood from the mucous canals, &c. From certain of these, particularly those first mentioned, recovery may take place when the treatment is judicious and energetic, but the convalescence is long, and its progress is often delayed by ulcerations of the cornea, or general asthenic ophthalmia causing blindness; by purulent depositions in the joints, or ulcerations or erosions of the cartilages, producing lameness; by otitis terminating in deafness; by abscesses in various

quarters, and by suppuration of the subcutaneous cellular tissue, causing cicatrices and alterations of the features. (*See the Complications, &c.*, § 42.)

37. The disease may assume a *semi-confluent form*, or one intermediate between the discrete and the confluent. This form is generally *superficial*, although not always or necessarily so, and much less frequently implicates the sub-cutaneous cellular tissue than the confluent. When thus superficial, whether semi-confluent or confluent, the eruption passes through its regular stages, but the inflammation does not extend deeper than the cutis vera. This superficial confluent form appears in the unvaccinated and sometimes in the vaccinated; and the pustules over the whole body maturate equally and regularly, pursuing their usual course, and occupying the full time to their termination or desiccation. "This form of the disease was well known before the days of JENNER, and is not to be confounded with the confluent small-pox, as modified by vaccination." (GREGORY.) It takes either the same time to maturate as the distinct, namely, seven days, or an intermediate period between the discrete and the confluent, videlicet, about eight days, the confluent generally requiring nine or even ten.

38. iv. VARIOLA AFTER VACCINATION. — The symptoms of this form of the disease may vary with the time which has elapsed from vaccination, but in the majority of cases they are the same as those characterising the variola verrucosa, or the horn-pock (§ 29.), or that very mild or mitigated form which maturates in five or six days, or in a shorter period. I have seen, on several occasions, and even described, as early as 1823 (*see Lond. Med. Repos.*, vol. xxi.), small-pox as it affected the members of the same family at different periods after vaccination; and in the younger persons, or those who had been vaccinated only ten or eleven years, the primary fever produced an eruption which was merely papular, or hardly vesicular, whilst in the older, or in those who had been vaccinated a longer period, the primary fever was more severe, and the eruption either vesicular and verrucose, or pustular in a distinct or even confluent form; the severity and fully-developed state of the disease being generally in proportion to the length of time which had elapsed from vaccination. In the former class of cases, the disease is thus more or less modified, and the secondary fever, either slight or absent; but in the latter, or pustular, the modification is either slight or hardly apparent, the secondary fever being more or less severe. I have, moreover, seen cases, after undoubted vaccination, having been effected from thirty to forty years previously, that presented the most malignant states of the confluent disease, the pustules maturating imperfectly or slowly, or being filled with a black ichorous matter, the distemper presenting the characters described when treating of *putro-adynamic fever*. (*See art.* FEVER, §§ 472. *et seq.*)

39. III. THE COMPLICATIONS OF SMALL-POX. — *A.* In a large proportion of confluent, and in some semi-confluent cases, the *mucous surfaces* are more or less implicated in the progress of the malady. The parts to which the air has ready access are most frequently affected, as the nose, mouth, trachea, &c.; but other parts covered by mucous membranes are also attacked, as the œsophagus, stomach, intestines, &c.; this *mucous complication* has been well described by Dr. GREGORY. The eruption appearing on these surfaces is sometimes distinct, but more frequently confluent. Numerous white points appear on the tongue, palate, velum pendulum, and pharynx. Hoarseness or alteration of voice indicates that the same or similar changes extend to the mucous surface of the larynx and trachea; and the pain in swallowing shows that the pharynx and œsophagus are also affected, especially in severe cases. In these especially, a cough, which is at first dry, tearing, or clangous, is present with more or less dyspnœa and oppression in the chest. As the malady progresses, the cough becomes more loose, but sometimes also more suffocative, and about the seventh or eighth day expectoration is more or less abundant, frothy, and viscid, containing some whitish specks. This affection of the respiratory surfaces often evidently increases, and extends over a larger surface; and constitutes a peculiar or specific form of acute *laryngo-tracheal bronchitis*, which may exist either singly or separately, or be associated with a *congestive pneumonia*, or superinduce this latter. When once this complication is present, and more especially when it is thus severely extended, most dangerous results are then generally observed. It is apt to occur in the most severe cases, or where the constitutional powers are weak, and the febrile symptoms present more or less adynamia. In these circumstances, this complication is the more liable to extend downwards; and, from the trachea, it is prone to advance to the bronchi of both lungs; the *bronchitis*, or the *pneumonia*, or the *broncho-pneumonia*, thus superinduced, being not only asthenic or congestive, but generally double, or implicating both sides; hence the severity, the rapidity, and the fatality of the results.

40. Even when the complication is limited to the mouth, throat, and larynx, or proceeds no further than the trachea, the œdema or swelling of the sub-mucous tissues may be so great, particularly about the seventh or eighth day, as to impede the free access of air to the lungs, and the same consequences ensue, especially in respect of the blood, as follow the extension of the complication to the bronchi and lungs. In either case, the blood does not undergo the requisite changes in the lungs, — it is no longer, or only imperfectly, oxidised or arterialised, and the following phenomena supervene: — The vesicles are flat, or, at least, do not acuminate, their contents are dark or ichorous, and the areolæ which surround them on the trunk and face are dark, or claret-coloured. Sometimes the surface presents a dark, erysipelatous appearance, attended by large watery blebs, or bullæ, from which an ichorous fluid escapes. On the succeeding day the tongue swells, and, with the lips and gums, exhibits a purplish hue; the extremities and nails become livid; low, muttering delirium is present; and either restlessness, anxiety, and dyspnœa succeed, or coma, distended bladder, or relaxation of the sphincters, takes place, and death soon afterwards supervenes.

41. The *digestive mucous surface* has presented changes more or less nearly approaching the pustular character, according to the accounts furnished by RIVERIUS, BRENDEL, WRISBERG, BLANE, and many others, and these have been

met with on the œsophagus, stomach, and small and large intestines. But the changes there observed, whether eruptive or pustular, have not been described with sufficient precision. Granting it to have presented somewhat of an eruptive appearance, it could not, however, have been pustular; for the nature of the tissues,—the structure of the parts, — admits not of a pustular formation. It is much more probable that, in the course of this as well as of other eruptive fevers, the glandular structures of the digestive canal become more particularly implicated, the morbid state of the blood exciting a special affection of these structures in the course of their functions, which have a very strict reference to the conditions of this fluid. In the most malignant or putro-adynamic state of this distemper, I have observed, especially in the dark races, the exudation of a dark, dissolved, or sanguineo-ichorous matter from one or several of the mucous canals, at an advanced stage of the distemper; an occurrence also observed in, and described when treating of, *putro-adynamic fever* and *hæmogastric pestilence,* and resulting from changes of a similar nature. In these, the alteration of the blood, and the loss of tone in the capillary circulation, admit of the exudation of blood from those parts or tissues especially, which, owing either to previous affection, or to loss of vital cohesion, are most prone to experience this change. (*See art.* HÆMORRHAGE, §§ 13. *et seq.*)

42. *B. The sub-cutaneous cellular tissue* is often implicated differently from, and even more seriously than, that which has been already cursorily noticed (§ 36.). In the discrete form, this tissue is rarely affected, but in the confluent or semi-confluent, and in the variety which Dr. GREGORY calls irregular or corymbose, the morbid action often extends deeper than the skin, and invades the cellular substance either partially or to a very considerable extent. According to this limitation or extension, the integuments are swollen and tense. When the scalp is affected, it becomes remarkably swollen, and resembles erysipelas of this part, excepting that it is attended or followed by a diffuse or confluent pustulation, or a succession of small abscesses. The salivation already described (§ 34.) is often accompanied with great swelling, more or less diffused, in the throat and neck. In some instances the tongue is involved; and when a diffused inflammation of the neck and throat thus extends to the tongue, an unfavourable issue then soon follows.

43. The cellular tissue in various other parts, especially where pressure is experienced, or where the vital cohesion of the tissue is the weakest, often becomes the seat of an asthenic inflammation, particularly in the more severe or malignant confluent cases. The sacrum, back, hips, elbows, scrotum, legs, and various other parts, may be the seats of boils or carbuncles, or of sphacelation. This change is most apt to appear during the secondary fever. Dr. GREGORY remarks, that he saw, at the Small-pox Hospital, an exact counterpart of the pestilential bubo and carbuncle in the groin of a small-pox patient. The face always suffers in these cases very severely; and if recovery takes place, it is not only pitted, but also seamed and scored by the cicatrizations consequent on the inflammation of the subjacent cellular tissue. Dr. GREGORY states, what I have also often noticed, that the disposition to suppuration of parts affected during the secondary fever of small-pox, appears to be universal and almost uncontrollable. In some few cases, the larger joints fill with purulent matter. Of the gangrene which so often occurs in the severe cases of variola, it may be remarked, that attempts should be made to prevent it, by attention and proper nursing and regimen, for in such cases it is often induced or aggravated by the absence of these, especially when the patient breathes an air rendered impure by putrid animal emanations, or contaminated by being too frequently respired, or breathed by too many persons.

44. *C. Ophthalmia* is a frequent and most important complication of small-pox. It has been unjustly stated, that the inflammation of the tissues of the eye is attended by the formation of pustules on the cornea and conjunctiva. But, although these tissues are very susceptible of the inflammatory states complicating this malady, they cannot admit of pustular formations. When inflammation implicates the eye, it may either be limited to the conjunctiva, or extend deeper, and even affect the whole organ. It is most disposed to take place when the changes in the skin arrest the natural functions of this surface, and when, with the secondary fever, there is a manifest contamination of the circulation, or some internal complication. The ophthalmia of variola may be the only prominent local affection, or it may be associated with others of an important or more dangerous nature. Dr. GREGORY remarks, that ophthalmia commencing on the tenth day of the disease sometimes advances so rapidly, that in forty-eight hours the whole eyeball is irrecoverably injured. The whole eye may even be converted into one large abscess. "More usually, the inflammation runs into some one of its less violent and more familiar consequences. An ulcer forms at the outer edge of the cornea, by which the aqueous humour escapes, or at which a staphylomatous protrusion of the iris takes place; or the aqueous humour becomes clouded, or specks form on the cornea, from which blindness, more or less complete or permanent, results. Many things concur to render it almost certain that the affection of the eye in small-pox is connected with some altered condition of the blood, and the retention of the vitiated matters which ought to have been eliminated." Of this there can be no doubt; for, as I have shown in various parts of this work, the depression of organic nervous power, and the contamination of the blood, superinduce all the complications observed in the advanced course of both continued and eruptive fever, and of other maladies impairing the functions of excreting and depurating organs.

45. *D.* It must be manifest that the *circulating fluids are more or less contaminated* by the poison of small-pox, whether that poison be communicated by the mucous or by the cutaneous surface. This contamination must necessarily exist in all cases of the malady, but in a very inappreciable amount in slight and benign cases; the eruption on the skin being its more prominent effect. Where, however, the vitiation is greater, and especially where the eliminating or excreting organs imperfectly discharge their functions, or where vital power is much depressed by either the primary or secondary operation of the poison, the circulating fluids, and particularly the blood, be-

come very remarkably and even sensibly altered. This alteration is manifested in various ways, but more especially in the advanced course of the malady; although it may be perceptible from the commencement of the primary fever. It is, however, more frequently noticed when the eruption appears, or at a later period, or when the eruption is proceeding to maturation. It is this contamination of the blood which, when more fully consummated, imparts the character of malignancy or of putro-adynamia to the distemper. This vitiation of the circulating fluids is rendered apparent, 1st., by the state of the blood when drawn from a vein; 2d., by the change in the appearance of the eruption; 3rd., by the hue of the surface in the spaces between the pustules, and by the lividity of the lips, tongue, and extremities; 4th, by the petechiæ, vibices, or ecchymoses, intermixed with the variolous papulæ or vesicles; 5th, by the filling of the vesicles with a bloody matter, or with a dark ichor, or even with dark, dissolved blood; 6th, by the passive hæmorrhages which occur from the mouth, or nose, bowels, or or urinary organs, or from the vagina, or from two or more of these outlets.

46. *a.* The more visible changes in the *blood* drawn from a vein are similar to those which I have described when treating of the *pathology of the* BLOOD (*see* §§ 125. *et seq.*), and consist chiefly of impaired crasis of the crassamentum, or a loose, gelatinous portion covering the black and hardly coherent portion of the coagulum. The alteration is often still more manifest in the blood poured out from one or more of the mucous canals, this fluid appearing as partially dissolved, dark, or ichorous, and being incapable of coagulating. — *b.* The *eruption* has at first a dingy or livid aspect; and as it proceeds to imperfect maturation, the vesicles fill only partially with a dissolved bloody serum, or with a matter containing the blood-globules changed to a blackish or brownish hue; and the vesicles are intermingled with petechiæ, &c., already mentioned. — *c.* The *general appearances* of these cases is often peculiar, and they are the most distressing and frightful manifestations of disease which can present themselves to our observation. The expression of the countenance is most anxious. The tumefaction of, and eruption on, the face; the exudations of blood from the mouth and nostrils; the closed, livid, and tumid eye-lids; the discharges from under them, or from the eruption; the swollen, softened, livid, or blackened hue of the general surface; the ichorous or bloody exudations from the urinary and genital organs and bowels, — all combine to impress the mind with an idea of a pestilence, exceeding in severity, and frightfulness of its aspect, both the plague and yellow fever; and to suggest the idea of a general dissolution or putrefaction of the structures, even before life has taken its departure, — a dissolution which has already partially taken place, in so far as that the tissues have actually lost a very large share of their usual vital cohesion, and have entered upon changes identical with those which appear soon after death.

47. The appearances now described are but rarely observed in the variola of the *white races*; yet I have met with them in a few cases, and in two or three instances the patients had been vaccinated many years previously. This malignant form of the malady was of more frequent occurrence formerly — before the introduction of inoculation and vaccination — than now, and was more common in some epidemic visitations of the distemper than in others. It was called by older writers, the *variolæ nigræ*, or black small-pox; and is, even now, the not uncommon form of the disease amongst the *dark races*, especially the *Negro*, and particularly when the distemper spreads by the respiration of miasms from the infected. When the adult female is the subject of this state of the malady, a most depressing or exhausting menorrhagia is apt to take place. I attended, some years ago, with Dr. GREGORY, a lady who was carried off by this form of small-pox. She had been vaccinated about thirty years previously, but she nevertheless presented the appearances just described. In this case, as in the following, mentioned by this physician in his work, the functions of the brain were not disturbed. "In February, 1842," Dr. G. remarks, "I saw, in consultation with Dr. L. STEWART, a lady in small-pox, whose whole body was the colour of indigo, and whom I at first believed was a native of Africa. She conversed with me in the most tranquil manner, and died a few hours afterwards, proving that the nervous system is not necessarily, nor is it even usually, implicated in the petechial form of small-pox" (*Op. Cit.*, p. 52.). This exemption of the brain from disturbance is very often met with in other malignant fevers, more especially in putro-adynamic fever, in malignant puerperal fever, in the hæmagastric pestilence, in plague and pestilential cholera, — maladies in which the circulating fluids are most signally vitiated. Dr. GREGORY has remarked, what I have reason to believe to be correct, namely, that death may take place in consequence of this remarkable condition of the blood, before any unequivocal signs of small-pox are developed, and has adduced two instances in which this appears to have occurred. Under common circumstances, the malignant or petechial form of variola exhibits an abundant confluent eruption, but this never makes much progress towards maturation. "Nature apparently gives up the struggle as hopeless. The patient is carried off very unexpectedly, perhaps on the fourth day, or from that to the sixth." But I have seen such cases sometimes protracted to the seventh or eighth day.

48. *E.* The *brain and nervous system* are often prominently affected in small-pox. This may occur at any age. Children are seized with convulsions on the accession either of the primary fever, or of the secondary fever; or they grind their teeth, roll their heads, scream, and squint. On these, inflammatory action, effusion, &c., supervene; or these changes have already taken place, to some extent, and occasioned these symptoms. In such cases, death very generally follows, either during an attack of eclampsia or convulsions, or with the usual signs of cerebral congestion and effusion. In older children and adults, the accession of the cerebral complication is attended by delirium of a violent or maniacal form — the *delirium ferox*. In some cases, the delirium is owing more to irritability of temperament, or peculiarity of constitution, than to inflammatory action; and in others, the nervous symptoms are attended by great depression of spirits, and by an inclination to commit suicide.

49. Dr. GREGORY remarks, that "*a peculiar nervous affection* often supervenes on the tenth day, when the skin is extensively occupied by the confluent eruption, without nervous complication. It is identical with that which is familiar to surgeons as the consequence of extensive burns and scalds. General tremors, low delirium, a quick and tremulous pulse, a dry tongue, collapse of the features, cold extremities, and subsultus tendinum, are the symptoms of this nervous complication, and the precursors of a fatal event." (*Op. Cit.*, p. 51.) This is an accurate description of the unfavourable termination of a large proportion of confluent cases, as observed in weak constitutions, when the vital resistance is insufficient to oppose the depressing tendency of the distemper, or when the powers of life have not been sufficiently supported, or when support has failed to be efficacious. It is of great importance to recognise the accession of this state of sinking of vital power, in order to have a chance of opposing it with success.

50. *F.* Certain of the *bronchial and pulmonary complications* have been already noticed (§§ 36, 40), especially such as arise from, or depend upon the contamination of the blood. But it is not unusual to observe a state of *bronchial irritation*, or *inflammatory action*, from the commencement of the febrile state, especially during the winter season. It may accompany the progress of the malady, without being materially increased, or without inducing a more violent form of the distemper. Frequently, however, and more especially in warm climates, or in the *dark races*, who have migrated to cold or temperate regions, the bronchitis extends generally to both lungs, and often to the substance of the lungs also, thus developing a form of congestive *broncho-pneumonia* (§ 39.). Sometimes associated with bronchitis, or with pneumonia, or occurring independently of either of these, *pleurisy* supervenes, and constitutes a most dangerous complication of variola. It has been noticed as follows by the able author just mentioned: — "Variolous pleurisy occurs between the twelfth and twentieth day. It is a peracute form of inflammation, remarkable for its sudden invasion, rapid progress, and invariable termination by empyema. The symptoms are very unequivocal: intense pain of the side, a hard or wiry pulse, shortness of breathing, great anxiety of countenance, a peculiarly pungent heat, and dry state of the surface, betoken but too forcibly the state of the pleura, even without stethoscopic aid. Blood-letting is almost powerless in this state of the disease. Death usually happens on the third, or, at farthest, fourth day from the invasion of thoracic symptoms." (*Op. Cit.*, p. 54.)

51. *Variolous pleurisy*, whether occurring as a complication or as a sequela, is not confined to the confluent, or any other form of small-pox. It may appear in the distinct or mild variety, or in the varioloid or modified disease, and in these forms it may be traced to exposure to a current of air, or to some other cause; and it may take place, especially when thus produced, at any stage of the malady. When it supervenes during the confluent distemper, and at the far-advanced stage, as just now described, it may justly be ascribed, as Dr. GREGORY has inferred, to the morbid condition of the blood at this stage, — a cause which sufficiently accounts for the rapid progress and fatal issue of the complication. The variolous pleurisy, however, may not only be acute, or attended by very sensible indications of its existence, but also *latent*, until the consequent empyema or effusion has produced very manifest effects upon the respiration and blood.

52. *G.* The *heart*, *pericardium*, and *blood-vessels* are more frequently affected in a very prominent manner than has been generally supposed. — (*a.*) The *endocardium* and *pericardium*, either or both, may be implicated in the progress of the more severe forms of variola, owing to the alteration of the blood, produced either primarily by the variolous poison, or, secondarily, by the absorption of a portion of the matter formed in the pustules, and by interrupted excretion; but, however induced, this complication is rapidly fatal, often without any other symptom than sudden sinking, and rarely with either pain or palpitation; more frequently with sudden anxiety and sense of dissolution.

53. (*b.*) That the internal surface of the *blood-vessels become asthenically inflamed*, as an advanced complication or sequela of small-pox, has been on several occasions witnessed by me at the infirmary for children since 1820; but I believe not so frequently as the endocardium and pericardium. The veins are certainly oftener implicated than the arteries, or, at least, more sensibly so, especially when the affection of the former gives rise to obstruction of the circulation through them. But, as I attempted to show many years ago, *asthenic phlebitis* may supervene in the progress of malignant distempers, and fail of producing lymph from their internal membrane capable of coagulating; the product of the morbid action being a fluid exudation, which passes into, and mingles with the blood circulating through the inflamed vessels, thus contaminating, or poisoning more fatally, the blood, heart, and blood-vessels.

54. *G.* The *purulent collections*, also formed within the capsules of joints, are rare complications or sequelæ of small-pox, yet they are not so rarely met with as to permit being overlooked. These deposits may be referred to the same series of changes, especially as regards the circulation, as have been noticed, and even fully discussed, with reference even to small-pox, when treating of purulent formations. (*See art.* ABSCESS, § 27. *et seq.*)

55. *H. Abdominal complications* are less frequent than the thoracic affections now passed under review. They are nevertheless sometimes met with, especially during the epidemic prevalence of the distemper; and oftener in some epidemics than in others. This circumstance is not always readily explained; although in some cases it may be referred to modes of living previously to, or at the period of infection, or to the water, or other peculiarities of the locality, or to the place of residence. — (*a.*) The most common of this class of complications are *diarrhœa* and *dysenteric affections*, sometimes leaving behind them, when convalescence has so far proceeded, diseased mesenteric glands, with emaciation and atrophy, as a sequela of the malady. Children, in unhealthy localities, are not infrequently affected by a mucous diarrhœa, or even with tenesmus and other symptoms of dysentery, in both the discrete and confluent forms of small-pox; the risk from this association being increased according to its severity.

In a few instances, blood is passed with, or intermingled with the stools to an amount which tends rapidly to sink the patient. If the stools be merely streaked with blood, the risk is less; but even these may indicate great danger.

56. (*b.*) Pain in the region of the *kidneys*, symptoms of congestion of these organs, and *hæmaturia*, are not uncommon in the severe states of the distemper, and are always to be viewed as most unfavourable occurrences, especially if the urine be scanty or suppressed. In cases of hæmaturia, the source of the sanguineous exudation has not been accurately determined, but there is reason to infer that it is the secreting structure of the kidneys; and that these organs are more frequently and seriously implicated in severe cases of this distemper than is commonly supposed. I do not say that they are so generally or so dangerously involved as in scarlatina, but this symptom, in connection with remarkable scantiness of the excretion, and an almost complete suppression of urine, have been remarked by myself and others sufficiently often to attract a more particular attention to the function of the kidneys during the course of the malady, and to the appearances they exhibit in fatal cases, than has hitherto been directed to them. It must be manifest, that even a partial impairment of the excreting offices of these organs, at any period of small-pox, must necessarily render the blood more and more vitiated, and superinduce various other dangerous or fatal results in vital organs, as I have fully shown when treating of *scarlet fever*. (See that *art.*, §§ 49. *et seq.*)

57. *I. Other complications* may occur, on rare occasions, in the course of variola, but they are very seldom detected during life, and more rarely looked for, or disclosed, on dissection. I shall only mention a few of those which have been noticed, and which should be kept in recollection during our dealings with this distemper: the presence of *intestinal worms*, which often aggravate the character of the disease, and which are often discharged at an advanced stage of the most severe and fatal cases; signs of inflammation, or congestion, or of functional disorder, of the *liver* or of its appendages, various changes in these parts being detected after death; intumescence of the *spleen*, and softening of this organ in fatal cases; one or other of the several forms of *erypsipelas*, or diffusive or asthenic inflammation of the cellular tissue; inflammation of the *urinary bladder*, and exudations of blood from the inner surface of this viscus; and a similar affection, with an imperfect development of pustules, vesicles, or papulæ, on the *labiæ valvæ* and *vagina;* this last being very frequent, and very troublesome in some cases.

58. ii. Small-pox may coexist with other specific or exanthematous Maladies.—This is a rare occurrence, but one which should not be overlooked.—(*a.*) *Measles* coexist with variola more frequently, perhaps, than with any of the exanthemata. This combination has been observed, both distempers running their normal course, and uninfluencing each other, by Diemerbroeck, De Haen, Weber, Tracey, King, Delagarde, Jones, and others. Manget says that measles delays the suppuration of small-pox, when both coexist; and Ettmüller states, what is very surprising if it be true, namely, that he saw a case in which the eruption of small-pox broke out on one side, and that of measles on the other side.—(*b.*) *Scarlet fever* has also been seen coexisting with variola, both distempers pursuing their regular courses, by Jensenius, Malfatti, Krügelstein, Marson, Barnes, and Dessessarz. Dr. Gregory informs me, that he has seen, at the Small-pox Hospital, many unequivocal cases of the concurrence of small-pox and scarlatina anginosa; and that variola and cow-pox may coexist, as Holm and others have contended. Dessessarz, who has paid much attention to the coexistence of variola with other specific diseases, mentions this concurrence of variola with *syphilis* and with *hooping-cough*, this latter delaying the eruption of variola, according to his observation. When vaccina and variola coexist, they may both run their usual course, or the one or other be more or less modified in aspect and progress.

59. iii. Variola in the pregnant and puerperal States and in the Fœtus.—When a pregnant woman is seized with small-pox, abortion or premature labour may or may not take place, and the disease may or may not be communicated by the mother to the fœtus. Much depends upon the mild or the severe character of the distemper. If the disease be not very severe, the mother may not abort, and the fœtus may not be infected; but if the distemper be severe, confluent, or malignant, abortion takes place, as in nearly all instances of other malignant or pestilential maladies; the fœtus being dead, and furnishing proofs of its having contracted the malady. The communication of variola to the *fœtus* has been observed by H. Augenius, Fernelius, Derham, Forestus, Mead, Mauriceau, Kite, Mortimer, Wright, Flinders, Watson, Dimsdale, Hunter, Lynn, Turnbull, Pearson, and Haygarth. Dr. Gregory remarks, that it does not necessarily happen that a pregnant woman, taking small-pox, conveys the disease to the child; several instances to the contrary have occurred at the Small-pox Hospital. An opinion was entertained by Dr. Mead (but erroneously), that where a woman undergoes small-pox without aborting, the infant would remain through life unsusceptible, having, in fact, passed through the disease in utero. Dr. Jenner has detailed two cases, which prove very satisfactorily that a fœtus in utero may contract small-pox, provided the mother be exposed to the contagion, although she herself does not take it. "An infant, born under these circumstances, sickened for the small-pox five days after birth, and twelve from exposure to contagion." (*Op. Cit.*, p. 751.) In several collections fœtuses are preserved whose skins are covered with variolous eruptions. The earliest period of fœtal life at which Dr. Gregory ever saw traces of variolous eruption is four months.*

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* The following abstract is taken chiefly from the American edition of Dr. Gregory's work on "*Eruptive Fevers.*" Dr. Mitchell (*Amer. Jour. of Med. Science*, vol. vii., p. 555.) adduces the case of a mother, who bore the marks of small-pox, with which she was affected in childhood, and whose infant was born in an apparently healthy state, but exhibited symptoms of variola three days after birth, and nine days after birth the pustules were in a state of complete maturity. M. Deneux (*Ibid.*, vol. xi., p. 499.) instances the case of a woman who had been vaccinated and never had small-pox, but who bore an infant covered at birth with confluent small-pox in the eleventh or twelfth day of the eruption. Dr. C. Guoli (*Ibid*, vol. iv., *new series*, p. 485.) states, that a child was born in June, 1841, covered with pustules of

60. When a pregnant woman is seized with small-pox so severely as to place her life in jeopardy, she aborts, the fœtus being generally dead; and the mother very rarely recovers. The abortion probably favours this event, especially if it be attended by much sanguineous discharge; but this event has taken place with equal rapidity where this discharge has been most remarkably small, or altogether wanting, as in a case which I lately attended with Mr. Barnwell. The same issue is observed in respect of other dangerous maladies, especially low fevers, scarlatina, measles, and the several malignant and pestilential distempers. When small-pox is caught shortly before delivery, so that the fœtus is born before the disease has proceeded its full course, the fœtus is generally infected, and the distemper assumes in the mother a most severe and complicated or confluent form, recovery seldom taking place. I have seen several cases of variola in the puerperal state, infection having taken place before confinement, but I have met with only one in which the disease presented a mild form.

61. iv. Of the Characters of the local Affection and of the Fever.—*A.* The *local changes*, whether external, as evinced by the varying condition of the eruption, or internal, and constituting the contingent complications of the malady, present every phase or gradation of inflammatory action, from the most slight to the most disorganising, from the sthenic to the most asthenic, or that most rapidly passing into the dissolution of structure.

62. *B.* The *type of fever*, whether of that ushering in the disease, or of that developing the suppuration or maturation, also varies in respect of power and vital resistance, — as respects the organic nervous energy and the states of the circulation and circulating fluids, — from that which may be viewed as inflammatory, until it sinks into the most malignant and pestilential, passing, in different cases, through every intermediate type, form, or phase; the local changes always presenting a more or less intimate relation to the state or character of the febrile commotion. Nevertheless, however numerous the forms or states, either of the local changes or of the constitutional disturbance, this distemper, more remarkably even than any other specific disease, preserves all its special properties unaltered and unalterable, elaborates the same poisonous miasm and virus, and propagates its kind through innumerable generations, without changing or even modifying any of its features. The same now as it was twelve centuries ago, it has lost none of its qualities or attributes, and gained no new property. We observe it now as it was observed from the earliest periods of its history; with the same remarkable modifications in both the local changes and the constitutional disturbance, the slightest and most benign form of morbid action, and the most pestilential; each form, and each intermediate phase appearing in the same epidemic, in the same locality, and in the same family, the distemper, nevertheless, preserving its special nature and identity.

63. The very remarkable modifications of variola now described are to be imputed — 1st., to vaccination; 2d., to inoculation; 3d., to infection by the mucous surfaces, and especially by the respiratory passages; 3d., to the dose or the quantity of the poison which has infected the frame, par-

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variola. The pustules were at their height on the second day after birth, and maturated on the fifth; but the child died on the ninth day after birth. The mother had been vaccinated when an infant, and had escaped small-pox. M. Gerardin (*Ibid.*, vol. vi., N. S., p. 210.) reported to the French Academy of Medicine, in 1842, an instance of a child born with the eruption in a state of suppuration; but no mention is made of the mother in this case. Dr. Joslin (*Ibid.*, vol. v., N. S., p. 249.) met with a case of small-pox in the fœtus, in New York, in 1842. The fœtus had on its body about 170 regularly-formed pustules, apparently such as they are from eight to ten days after the attack. The child lived only a quarter of an hour. The infection had been received by the mother just thirty days previous to the birth of the child. She was exposed but once to a single case, at the very commencement of the eruption, and for a single day. She had been vaccinated in early childhood, and the operation had been repeated on the day of exposure by Dr. Joslin himself, but without effect. M. Dapaul (*Bullet. de Thérap.*, 30th April, 1849) saw a case of transmission of variola from a mother to her child, which had numerous pustules at birth. The mother had visited a person with the disease a short time before, without taking it. A case occurred in the Maternity Hospital, in Paris, in which the face, scalp, and different parts were covered with the pustules of small-pox at birth, though the mother retained the marks of vaccination, and had never had the small-pox. About ten days before, she had seen a patient at La Pitié, near another with small-pox (*Lancet*, 18th Feb., 1843, p. 741.). Dr. Mead (*Works*, ch. iv., p. 253.) has recorded an instance in which a woman was delivered of a dead child at the full time, covered with variolous pustules. She formerly had the disease, and was attending her husband with it, when delivery took place. Dr. Lebert (*Bullet. de Thérap.*, 30th April, 1849) exhibited to the Biological Society of Paris, a fœtus about four months old, whose body was covered with pustules of variola. The mother had the disease slightly, and aborted during her convalescence. Dr. King (*New York Med. & Surg. Journ.*, April, 1840, p. 292.) mentions the birth of a living child at seven months, covered with umbilicated pustules, the mother having entirely recovered, and presenting at the time of its birth no evidences of the eruption, excepting the red spots succeeding the scabs; the child having been born twenty-one days after she was first attacked, or seventeen days after the appearance of the eruption. Dr. L. V. Bell (*Amer. Journ. of Med. Scien.*, May, 1836) adduces an instance of a lady who had confluent variola at the seventh month of pregnancy, and escaped without abortion, — a rare circumstance in confluent small-pox. At the expiration of her full term, she was delivered of a healthy child, whose abdomen and thighs were marked with decided small-pox pittings, and who was unsusceptible of the vaccine disease. Van Swieten (*Commentaria*, vol. v., p. 8.) records, amongst several others, a similar case to the last; the child was born at the full time, with pits of small-pox, the disease having been transmitted to the fœtus through its mother, who had herself undergone the disease. Dr. Hosack (*Med. Essays*, vol. ii., p. 111., & vol. iii., p. 473.) refers to numerous other instances, recorded by authors, of the communication of variola to the fœtus in utero.

"It will be found, on examination of the preceding and of other cases, that the communication of variola to the *fœtus in utero* has occurred after vaccination of the mother in infancy, and after her revaccination on the day of her exposure, and also after variola, both naturally and by inoculation. It has also taken place when the mother is yet suffering from the disease, and after she has passed through it years previously, and when she herself escapes entirely.

"The fœtus may be infected by absorption of the virus through the mother, without her experiencing any effect from it; or the disease may be transmitted directly by inoculation of the mother, and may be communicated any time from the fourth month (and perhaps earlier) to the full time. The fœtus may be thrown off in three or four days after cessation of motion, or may be retained for three or four weeks.

"The child may be covered with eruption at birth, and this eruption may present itself in different stages of its progress in different cases, even up to the eleventh or twelfth day of the eruption, or may not appear until three or four, or even seven days after birth. It may also be born at full time, with pits left by the disease some weeks previously."

The child either falls a victim to the disease at once, or lingers for only a few days; but it has been born healthy at the full time, with marks of previous disease; and it has survived when the disease, in a mild form, has appeared after birth. On this, and all other topics connected with variola, the admirable Commentaries of Van Swieten on the Aphorisms of Boerhaave will be studied with advantage.

ticularly by these passages, relatively to the vital power and resistance of the patient; 4th, to the constitutional power, habit of body, diathesis, temperament, and health of the patient; 5th, to his race, or to the variety of his species; 6th, to his modes of living, mental power, and moral courage; 7th, to the physical agents which surround and influence him, especially the conditions of the atmosphere in respect of temperature and humidity, of purity and requisite renewal,—in short, to the various circumstances which I have pointed out, in full detail, when treating of the several causes and sources of pestilences, with reference to their removal and avoidance (*see art.* PESTILENCES, PROTECTION FROM); and, 8th, to the character or nature of the prevailing epidemic constitution.

64. According to the influence of these, either singly or in various combinations, the disease assumes a mild, or a distinct, or a severe, or a semi-confluent, or a confluent, or a complicated, or a malignant form, the primary and consecutive fever developing these several states, or at least presenting, conformably with them, and with strict reference to them individually, either a slight, or mild, or an inflammatory, or an adynamic, or asthenic, or a putro-adynamic, or a malignant character, the appearance of the eruption being one of the chief indications of the type or character of the fever. Certain of the modifying influences now enumerated may require a brief remark. The first four mentioned manifestly need no comment.

65. The *race*, or the *variety of the species*, to which the patient belongs, is of the greatest importance in modifying the distemper. The white race, especially that inhabiting northern and temperate climates, experiences a much milder and, more frequently, a discrete form than the dark races, particularly the Negro. Amongst the latter races, the disease more commonly assumes a confluent or malignant form, and is the most dangerous pestilence which can overtake them. It is to them what the hæmogastric pestilence is to the Europeans when they migrate to the hot countries where and when that pestilence is epidemic. Amongst the dark races this pestilence is comparatively mild, but most fatal amongst the white race; whilst the very opposite obtains in respect of small-pox. As to this, I speak from personal observation. There is nothing which can be conceived more pestilential than I have seen small-pox when it has seized upon a Negro town or community: the general malignancy of the distemper, the desertion of the afflicted by the healthy who have not passed through the disease, and the semi-putrid or decomposed and hideous appearances of those who are yet alive, but nevertheless exhibit much of the characters of structural dissolution, cannot fail of making a never-to-be-forgotten impression on the observer.

66. The state of the atmosphere is also very influential in forming the general character of small-pox. In dry, pure, and moderately cold or cool states of the air, this distemper is much milder and less prevalent than in hot seasons, and in humid and still states of the atmosphere. In countries enjoying the former atmospheric conditions, the malady is less generally and severely epidemic than in warm countries, where the latter conditions obtain; there are, however, frequent exceptions to this law that probably are dependent upon the unknown nature of epidemic constitutions; but this topic, and others connected with it, will be considered more fully in the sequel. (§§ 93. *et seq.*)

67. The form or character of the malady thus depending upon the circumstances now mentioned, and modified as above described, must, in the present state of our knowledge, be viewed as the result of agencies which tend either to resist or to limit the susceptibility and the poisonous properties of the miasm or virus which produces it on the one hand, or to increase that susceptibility, or to develope the injurious operation of these poisonous properties on the other. We observe, 1st., that a previous attack, with very rare exceptions, destroys the susceptibility of a second infection; 2d., that vaccination produces a similar effect, but for a certain time only, at least in many instances; 3d., that the mode of communicating the malady, which is the best calculated to secure the introduction of the smallest possible quantity of the poison into the system capable of infecting it, is the safest and best, namely, inoculation; 4th, that whatever tends to promote the excreting functions, to depurate the blood, to resist the contamination of the fluids, and to support the vital powers, also favours the production of a mild or discrete form of the malady; 5th, whatever has a contrary tendency — whatever occasions contamination of the blood, as a foul, close, or frequently-respired air, and interruption of one or more of those functions, by means of which effete or injurious elements are eliminated from the blood — developes a severe, a complicated, or a confluent and malignant form of small-pox; and, 6th, whatever reduces vital power and resistance at the period of infection, and favours the reception of a large dose of the poisonous miasm into the lungs, as in cases of infection by respiring the morbid emanation directly or closely from the sick, relatively to the susceptibility of the individual, generally gives rise to the dangerous varieties of the distemper just mentioned.

68. v. APPEARANCES ON DISSECTION. — The changes which more especially belong to small-pox are those observed in the skin and mucous surfaces. Those of the skin require no remark. The rare exception, however, of death occurring either before the eruption has appeared, or at a later period, when the amount of internal disease, or the poisoned state of the blood, has prevented the evolution of the eruption, should be kept in recollection. The pharynx, larynx, and trachea generally display more or less disease, especially in cases which have proved fatal from the seventh to the tenth day. The mucous membrane of these parts appears covered with viscid, puriform matter, more or less copious, and of a brownish or greyish colour. Underneath this, the membrane is generally found congested, softened, thickened, and pulpy; and in the more malignant cases it is black and sloughy, and exhales an offensive odour. Congestion, softening, discolouration, &c., with a muco-puriform or sanguineo-puriform exudation, may often be traced down the trachea, and thence to the bronchial ramifications to a greater or less extent. The lungs frequently evince congestive or inflammatory appearances, or rather such changes as may be referred to a congestive pneumonia, or this associated with bronchitis, or an alteration approaching in appearance to that of

splenisation, with or without a puriform infiltration. The pleura is often inflamed, but it presents no changes different from those which are often seen in asthenic inflammations of serous membranes, occurring in the course of other exanthematous and adynamic fevers. As in these, so in this, the inflammatory affection is attended by injection, softening and thickening of the membrane, with an exudation of lymph forming a layer varying very much in thickness and density. These changes extend more or less to one or even to both sides; the cavity of the pleura also containing much sero-puriform fluid resembling a dirty whey, or a mixture of milk or cream and water.

69. It was believed by many that, in the dangerous states of small-pox, a pustular eruption took place in various portions of the digestive canal; and there can be no doubt of considerable alteration being observed in this quarter. These alterations may have assumed a papular or vesicular form, or one approaching the appearance of pustules, when the follicular glands of the digestive surface were chiefly inflamed. These changes have been remarked in the œsophagus, in the stomach, and in the small and large intestines. Dr. Gregory remarks, that "much discussion has taken place regarding the occurrence of variolous pustules on the gastro-enteric mucous membrane. Cotugno, Wrisberg, Reil, and others, who have paid great attention to the subject, concur in opinion that this structure is not capable of developing them. Sir G. Blane, again, reports a case where this membrane presented the appearance of ulcerated spots, which he compared to variolous pustules. The experience furnished by the Small-pox Hospital is in favour of the old doctrine. Inflamed, enlarged, and ulcerated follicles, with petechial patches, may indeed be noticed in a few cases; but such changes are in all respects the same with those observable in typhoid fevers." I have seen ecchymoses with or without those alterations, in the digestive mucous surface, and in the internal surface of the urinary bladder, but much more rarely in this latter situation. The kidneys are often congested, and the internal surface of the pelvis of the kidneys is also congested, softened, and discoloured. But these appearances, as well as those observed in the brain and its membranes, in the spleen, liver, and biliary organs, are very much the same as those seen in fatal cases of the other exanthemata, and of low or malignant fevers.

70. IV. Diagnosis of Small-pox. — It is not easy, and, indeed, seldom even possible, to distinguish the primary fever of variola from that of the other exanthemtaa, or even from the commencement of continued fever. In children, however, there is a more frequent occurrence of convulsions, more sudden and severe vomiting, and pain at the epigastrium, than in these; and in adults the muscular and other pains are more severe.—(*a.*) The fever of *measles* is more generally attended by cough and watering of the eyes than that of variola; and the eruption is about twenty-four hours later in the former than in the latter. The papulæ of small-pox are firmer and deeper seated than those of measles, which are superficial, and do not give so knobby or so granular a sensation to the touch as those of the former, which implicate the cutis vera.

71. (*b.*) *Febrile lichen* may be confounded with small-pox; but the interval between the occurrence of rigor and the appearance of eruption is much shorter in the former, generally only twenty-four hours, or half the time of that of the latter. The eruption of variola generally appears first on the face, whilst that of lichen takes place uniformly over the head and trunk, is superficial, and devoid of the granular feel to the touch which belongs to variola. (*See art.* Lichen.)

72. (*c.*) A form of *secondary syphilis* sometimes occurs, in which the eruption over the face and trunk is very similar to distinct small-pox, and passes through the grades of papulæ, vesicles, and pustules. It is, however, generally preceded by little, or by a slighter fever, and the eruption is much more tedious in its development than that of variola; the pustules do not maturate, or proceed simultaneously, but irregularly, or in successive crops. The general aspect of the patient, and the history of the case, will farther assist the diagnosis.

73. (*d.*) The diagnosis between *variola* and *varicella* has been fully discussed, and the distinct natures of these have been shown at another place; but independently of various other points of difference, the impossibility of inoculating the latter, the occurrence of it after cow-pox, and even after small-pox, and the absence from varicella of the deep-seated granular sensation to the touch, and of the umbilicated vesicle, characteristic of the variolous eruption, sufficiently distinguish the one from the other.* (*See art.* Chicken-pox, §§ 2, 3, 10, 11.)

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* The following remarks respecting the distinct nature of *Chicken-pox* and *Small-pox*, contained in Dr. Gregory's excellent work, already referred to, deserve perusal, and quite agree with my own observation. "The first thing I observe in varicella is the eruption of vesicles of the size of a split pea, being simple elevations of the cuticle, or minute blisters. The parts chiefly occupied by the eruption are the back and scalp. The face is not so universally the seat of eruption as in variola; nevertheless, at times, the face is extensively occupied. The vesicles vary in shape; Dr. Willan, who loved minuteness, wishes to distinguish three kinds, — the lenticular, the conoidal, and globate. I cannot see these distinctions myself. The vesicles are surrounded by a superficial and narrow areola. They appear in successive crops for two or three days. While the new vesicles are forming, the old ones shrivel and dry up. On penetrating the vesicles, a clear lymph, scarcely at all mucilaginous, escapes, and the cuticle falls to the level of the surrounding skin. There is no tumour, no varus. If the vesicles remain unbroken for twenty-four hours, the contained fluid becomes slightly opaque. They are very itchy, and when rubbed, a degree of superficial inflammation may succeed, sufficient to convert the lymph into an imperfect pus. The scabs of varicella are very small, and as the lymph is wanting in mucilaginous quality, they are granular. The desiccation is very rapid, and in six days the complaint completes the whole cycle of its phases. No constitutional symptoms of much importance are present. The complaint often shows itself in schools, and runs through all the young members of a family. It is manifestly infectious and epidemic."

Varicella almost exclusively attacks children, it is very rarely seen in adults. "It is taken indiscriminately by those who have and those who have not been vaccinated. It is now nearly always taken *after* vaccination. Whether it was taken equally after inoculation of small-pox I cannot tell from my own experience, but I have the authority of the late Sir Henry Halford for saying that it was. These general considerations are of themselves sufficient to decide the question of non-identity. But if we examine the subject still more closely we find that the organization of the varicelloid vesicle differs from that of the variolous; there is no umbilication, no central depression, no slough. There is simply elevation of the cuticle, of irregular and undetermined arrangement. Here we see no groupings into threes, or fives, — no crescentic or circular figures formed. Everything in varicella is hurried forward — the incubation, the eruption, the desiccation."

74. V. **The Prognosis of Small-pox** is tolerably manifest from what has been already stated. The circumstances enumerated above as modifying and aggravating the fever of small-pox (§§ 63. *et seq.*), increase also the *danger* of the distemper; but the following more especially tend to this: — 1st. The quantity and confluence of the eruption. 2d. The state of the circulating fluids. 3d. The presence and nature of the complications, especially those of the respiratory organs and nervous centres. 4th. The age, habit of body, and temperament of the patient. 5th. The circumstances and influences under which the patient is placed; and 6th. The season, temperature, and epidemic constitution in which the disease occurs.

75. *a.* A *confluent form* of the malady should, even when proceeding favourably, be viewed with distrust; for, in children, a fit of convulsion may occur, and carry off the patient; and in adults the blood may become contaminated to an extent incompatible with the continuance of life; or the secondary fever may further implicate vital parts. If the vesicles on the trunk and extremities be flat, with a claret-coloured or livid areola, "while the eruption on the face is white and pasty, no reasonable hope of recovery can be entertained." An excessive quantity of eruption always tends to depress vitality, to vitiate the blood, and to favour the occurrence of internal complications, which concur with these to destroy life. On the other hand, if the pustules on the extremities acuminate, and exhibit a crimson areola, a good ground of hope is furnished.

76. *b.* The *contamination of the fluids*, as shown by the hue of the surface, the colour of the lips, tongue, and gums, so far as they can show it; by the appearance of the vesicles; by the state of the evacuations; and by whatever indicates a tendency to putrescency, or a partially dissolved state of the blood and depressed organic nervous influence, is extremely dangerous. Petechiæ, ecchymosis, gangrenous, or sloughing, sores; hæmorrhages from mucous canals, the blood being dark, dissolved, or ichorous; menorrhagia, or hæmaturia; the vesicles being filled with a dark, bloody, or ichorous matter; purulent depositions in the joints, &c., are generally fatal indications.

77. *c.* The occurrence of any of the *pulmonary complications* mentioned above; cough or hoarseness at an early period of the disease; hæmoptysis at a more advanced stage; bronchitis, or congestive pneumonia, or asthenic pleuritis, especially when either extends to both sides, are extremely unfavourable. The appearance, also, of an abundant or confluent eruption in the puerperal states, and particularly soon after parturition, is always attended by the utmost danger.

78. *d.* The state of the *nervous system* is most important in the diagnosis. Continued delirium, or prolonged want of sleep, restlessness, moaning, despondency, or an inward persuasion of death, or an apathetic condition, or unconcern as to the result, so frequently observed in pestilential maladies, suppression of urine, sopor, lethargy or coma, leipothymia, or a tendency to faint upon raising the head from the pillow, or attempting to sit up, are severally dangerous or fatal symptoms.

79. *e.* The *age* of the patient is of much importance in the diagnosis, especially in confluent and semi-confluent cases. Dr. Gregory remarks, that "the extremes of life are those on which small-pox always falls the heaviest. Persons above 40 years of age seldom recover even from the semi-confluent small-pox. Children are in danger from an amount of eruption that can scarcely be called semi-confluent. In both, the processes of maturation and cicatrisation are attended by great exhaustion of nervous power, the result of which is often the setting up of acute inflammation in an internal organ essential to life — either the brain, the larynx, or the lungs. The most favourable age for taking small-pox is from the seventh to the fourteenth year, when the powers of life and reproduction are in their fullest vigour."

80. *f.* The *habit of body and diathesis* have considerable influence on the result. A plethoric habit of body, a sanguine, a melancholic, a leucophlegmatic, or a bilious temperament, constitutional asthenia or debility, and a scrofulous diathesis, are more or less aggravating circumstances, as respects either the severity of the disease, and abundance or confluence of the eruption, or the complication and sequelæ of the malady.

81. *g.* The circumstances which indicate a *favourable issue* are, a discrete form of the disease

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There is a form of Small-pox which, in some of its features, and from its mildness, may be mistaken for varicella; "and physicians in former times, looking only to the general, and neglecting the minute anatomical characters of the eruption, have thought proper to confound the two diseases. By way of distinction we will call the one *varicella vera;* the other, *variola varicelloides.* In the true varicella there is little or no premonitory fever. In the variola varicelloides there are at least forty-eight hours of preceding febrile disturbance. In the varicella vera there are no hard vari or tubercles. In the varicelloid form of variola, tuberculous elevations of the skin are distinctly perceptible. In the vesicles of the one there are no central depressions, in the other central depressions exist." In true varicella the crusts quickly fall off, and rarely leave any pits. Can varicella be communicated by inoculation? "Dr. Willan entertained the belief that it can; but his experiments are few (two or three only), and these few, to my mind, very unsatisfactory. Since his time, Mr. Bryce, by more extended and more careful investigation, has set the question at rest. He states that he has inoculated with the fluid of varicella vera, at all periods of the disease, and at all seasons of the year, children who had never undergone either small-pox or cow-pox, and yet that he had never been successful in producing from it either variola or varicella. Since the date of Bryce's experiments (1816), I know of none on the inoculation of varicella."

What, then, are the arguments which can be brought forward in support of the doctrine of the identity of small-pox and chicken-pox? I have adduced the arguments which have been urged by Dr. Thomson, and others in favour of this doctrine, and I have answered them seriatim in another place (*see art.* Chicken-pox, §§ 2, 3. 10, 11.); but, nevertheless, it is interesting to know what further Dr. Gregory has stated as to this topic. Dr. Thomson's great argument is, "that varicella presents itself when variola prevails, and never without. Hence," says he, "we may deduce the probability that one contagion is operating, not two." The answer to this is, that the facts are incorrectly stated. Varicella frequently prevails without variola. Dr. Mohl has shown this most satisfactorily from the experience of the Copenhagen epidemics. From 1809 to 1823, Chicken-pox was annually observed at Copenhagen without accompanying variola; since 1823 both diseases have prevailed epidemically, but the physicians could always trace their sources, and this convinced them that the generating miasms were distinct. Besides, the doctrine goes for nothing if it can be shown, as has been shown over and over again, that some children take varicella after cow-pox, and others cow-pox after varicella, while sometimes both diseases may be seen going through their phases at the same time. "It cannot be doubted for one moment, after reading the details of this controversy in the works of Dr. Thomson and elsewhere, that a very large proportion of the cases of alleged secondary or recurrent small-pox, are really cases of genuine lymphatic varicella mistaken for small-pox;" or, I may add, that the supposed first attack of variola was merely that of varicella.

the absence of any symptom of complication; a natural tone of the voice, and freedom from cough and hoarseness; an age between six and twenty-six; the occurrence of the malady at a cool, dry season, and under other favourable influences, as respects air, ventilation, and healthiness of position.

82. *h.* Much, however, depends upon the state of the patient before the accession of the malady, upon the influences in operation during the treatment, upon the measures which have been employed at the commencement of the distemper, or during its earlier stages; upon the purity of the air, and the ventilation of the patient's apartment; upon his nursing, and the noninterference of friends; upon the character of the prevailing epidemic, or of the reigning epidemic constitution; and upon various subordinate circumstances and unexpected contingencies.

83. VI. The Causes of Death from small-pox are, 1st., during the first week, or prior to the maturation of the eruption, the poisonous influence of the variolous miasm or virus on the blood, and the consecutive effects of the poison on the organic nerves and nervous centres; 2d., during the second week the greater number of deaths occur, and the most common cause is asphyxia, or consecutive vitiation, and interrupted oxidation of the blood, owing to the prominent affection of the respiratory passages, or of the lungs, or to suppression or interruption of the urinary excretion; 3d., during the third week, or when secondary fever has advanced, death may be produced by effusion on the brain, or by effusion in the pleura, or in the pericardium, or by the complications which occasion it in the second week; or by gangrenous destruction of some portion of the integuments; 4th, during the fourth, or following week, death may result from erysipelas, or from some other complication or sequela of the distemper. The following table, furnished by Dr. Gregory, exhibits the days on which 168 cases of small-pox were fatal at the Small-pox Hospital in 1828–29, and proves that no importance can be attached to critical days in this distemper:—

Days.	Fatal Cases.	Days.	Fatal Cases.	Days.	Fatal Cases.
3d.	1	13th.	11	24th.	3
4th.	5	14th.	5	25th.	1
5th.	10	15th.	7	27th.	1
6th.	5	16th.	5	28th.	1
7th.	11	17th.	3	29th.	1
8th.	27	18th.	3	31st.	1
9th.	15	19th.	1	32d.	1
10th.	14	20th.	2	35th.	1
11th.	16	21st.	3	38th.	1
12th.	11	23d.	1	39th.	1

Table exhibiting the total Number of persons having Small-pox, admitted into the Small-pox Hospital of London, in the Years from 1841 to 1850, inclusive, with the Proportion of Cases admitted *after Vaccination*, and the Mortality in each Class respectively.

Years.	Total Admissions of Persons having Small-Pox.	Deaths.	Per Centage of Deaths.	Total of Persons vaccinated with Cicatrices.	Deaths.	Per Centage of Deaths.	Total of Persons unprotected, including the Vaccinated without Scars.	Deaths.	Per Centage of Deaths.	Per Centage of Admissions after Vaccination with Scars.	Persons professing to have had Small-pox previously.	Deaths among Ditto.
1841	342	74		151	10		191	64		44	2	1
1842	141	34		62	4		79	30		44	1	0
1843	149	27		69	0		80	27		46	2	0
1844	643	151		312	24		331	127		50	3	2
1845	367	79		217	13		150	66		60	3	0
1846	147	29		77	5		70	24		52	2	0
1847	450	81		230	17		220	64		51	8	3
1848	686	168		365	38		321	130		53	4	2
1849	190	33		115	11		75	22		60	4	0
1850	307	58		155	8		152	50		50	1	0
Total in 10 Years.	3422	734	22	1753*	130	7	1669 †	604	36	51	30 ‡	8

84. VII. Causes of Small-pox. — i. From the earliest accounts of small-pox to the days of Boerhaave, variola was considered to owe its origin to the same causes, with certain unknown modifications, which give rise to other epidemic maladies, aided by infection and contagion. It was thus believed that small-pox might be generated *de novo*, from some defect or vice in one or more of the six non-naturals, — air, aliment, the secretions, exercise, sleep, and mental emotions, but that when thus produced it would spread by infection. Boerhaave was the first to contend that this doctrine was incorrect, and that small-pox was in all cases the product of a specific miasm or poison, derived from the same malady. "He acknowledged that the miasm must originally have sprung from some fortuitous combination of common causes, and that what had happened once might happen again, but he held that this contingency was improbable, and might safely be excluded from our reasonings."

85. It is impossible to say, with any degree of confidence, in what source, or in what combination of causes, or under what influences, the poisonous miasm first constituting and afterwards perpe-

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* Nearly the whole of these 1753 cases were above the age of fifteen years.

† Many of the persons alleging to have been *vaccinated*, but not showing cicatrices, were doubtless duly vaccinated; but to distinguish such cases from the others was impossible.

‡ N. B. The persons professing to have had small-pox at some former period, sometimes announced themselves to have been inoculated, sometimes to have had the casual small-pox, but in no one instance was there any corroborating evidence of the truth of the statement. These cases, therefore, are included in the third column of "*persons unprotected.*"

tuating the disease was produced. There is some reason, however, to infer, from what we know of the origin of certain distempers, and of the communicability of them from the lower animals to man, and from the proofs of the causes, and of this communication of these distempers, furnished by the old historians, as shown in the articles Epidemic Influence (§§ 12. *et seq.*) and Infection (§§ 4. *et seq.*), and by modern pathological and other writers, that this malady, as well as they, originated in the lower animals, and extended from them to the human species by infection or contagion. However this may be, there is no proof that the disease appears or becomes epidemic, after longer or shorter intervals, owing to certain combinations of causes or influences, producing it *de novo*. On the contrary, there is every reason to infer, that it is perpetuated by its miasms, or effluvium, or virus, which spreads it by infecting the healthy, either directly, or indirectly by the media of substances — of *fomites* — which preserve, for longer or shorter periods, and thus propagate the poisonous agent (*see art.* Infection, §§ 16. *et seq.*); and that this distemper has been thus perpetuated since its first appearance in the 6th century. Instances are constantly occurring of either single cases, or of the outbreak of several or of many cases, without proofs of antecedent infection or contagion having been obtained, especially as respects the earliest cases. But as regards these, all the preceding circumstances or occurrences may not be known, or even may not admit of recognition; and as respects many of these, the same or similar circumstances may have taken place to those which occurred in the following case adduced by Dr. Gregory :— A child took the small-pox, in the country, under circumstances which seemed to exclude all suspicion of infection. She had never left the house for several weeks; the few neighbours who had called were free from sickness, and no small-pox existed in the neighbourhood. During her convalescence, a looking-glass being put into her hands, she immediately said, " My face is exactly like that of the child at the door, from whom I bought the beads." On inquiry, it was found that some pedlars had passed through the village, and that the child had been to the door, although she had never left the house. Had this child died, or been an inattentive observer, the origin of this attack of variola must have remained for ever mysterious.

86. When we consider the facts connected with *infection*, as I have shown in that article, and the long periods during which the infectious miasm may be retained by fomites without losing its specific character and operation, and connect this with the numerous substances which may thus become the media of infection, and with the many occasions on which one or other of these media may have come within the sphere of our senses, without our recollection or knowledge, — and, moreover, when the long period which elapses from the moment of exposure to infection to the manifestation of the distemper is taken into account, the frequent difficulty or impossibility of accounting for the infection cannot be a matter of wonder. The poisonous miasm of small-pox is given out from all the mucous, cutaneous, and excreting surfaces,—especially the lungs and skin, — the exhalations, the secretions, the excretions, the matters in the vesicles and pustules, and the scabs, all contain this poisonous material, with all its specific characters; and this material attaches itself to many dissimilar substances, especially to the bed clothes, body clothes, woollen and cotton articles, &c. These when wrapped up, or in any way excluded from the free action of the air, retain the specific miasm for a very long but indeterminate time, and give out this miasm when opened up and exposed to the air.

87. The length of time during which fomites will retain the infectious miasm, with all its properties unimpaired, has not been ascertained; but there is reason to believe that, when they are excluded from the air, this miasm may be preserved for many months, or even for some years. The stages of the distemper during which the infectious emanation is most abundant and noxious, have been variously estimated, but without any accurate data. There is every reason to infer that the disease may be communicated by respiring the air containing the morbid effluvium from the commencement of the eruptive fever; and it may be admitted, that the infectious miasm is most powerful or concentrated when it is most manifest to the sense of smell. The dried crusts of the pustules, or scabs, not only also possess a contagious quality, but also retain this quality for a very long time, especially when shut up from the atmosphere, or undecomposed; and the dead body possesses also the power of infection, both by the effluvium which it exhales, and by the matter in the pustules. How long this power continues after death, has not been determined with precision, but it may last from a week to a fortnight, according to the exposure of the body to the air, and to the temperature and humidity of the atmosphere.

88. The distance at which the infectious property may be exerted, has been variously estimated by Dr. Haygarth and others. Some suppose that the sphere of infection does not extend further than a few feet, whilst others contend that it may extend to many hundred feet. An American physician informed Dr. Haygarth, that the infectious effluvium crossed a river 1500 feet wide, and affected ten out of twelve carpenters at work on the other side. The sphere of infection mainly depends upon the state of the atmosphere, and the existing epidemic constitution: a still, warm, humid, and impure air extending the sphere of infection; and a cool, dry, and pure air, and free ventilation, circumscribing this sphere, by diluting and dissipating the poisonous miasm.

89. It is obviously of importance to ascertain what degree of cold and heat, or what proportion or amount of chlorine gas, or of the chlorides in solution, is capable of destroying the poisonous miasm or virus contained in fomites, in order that these agents may be employed in disinfecting bed and body clothes; but our knowledge of the disinfecting powers of these agents, although considerable, requires much greater precision than it at present possesses. There is, however, sufficient reason to believe, that a temperature of about 200°, or somewhat above this range, is sufficient to destroy the infectious property, and that these chemical agents produce a similar result in moderately concentrated solutions.

90. During the last century, and even at the commencement of the present, a singular notion as

to the origin of small-pox, and as to the possibility of the entire extirpation of the distemper, was promulgated, and even entertained by some respectable writers, namely, that small-pox was generated *de novo* in infants by the blood of the mother left in the portion of the umbilical chord, attached to the fœtus on tying the chord—that the fluids remaining in this portion of the chord being absorbed by the fœtal vessels, thereby contaminated the blood and frame of the infant, and thus developed anew the distemper under consideration, independently of infection or contagion received from any other source. It was therefore recommended by these writers, in order to prevent the generation of the distemper, and ultimately to procure its entire extirpation, that the portion of the chord attached to the fœtus should be thoroughly emulged, and the fluids pressed out of it, upon securing it at delivery. That small-pox neither originated in this source, nor can be extirpated or prevented by any method of managing this operation, will not be disputed at the present day, however great importance may be attached to it in other respects.

91. ii. *The causes predisposing to, or increasing, the susceptibility of the infection of small-pox* are not wanting in importance.—*A. A very early age* has much influence in predisposing to this distemper. It has been admitted by Dr. HAYGARTH and other writers, that the greatest mortality by small-pox takes place in the early periods of life. In 1795 (before the introduction of vaccination), it was computed that, in Chester, nearly half the deaths among children below ten years of age was due to small-pox. From the data furnished by Mr. FARR's first and second reports, it appears that out of every hundred who died of small-pox in England, seventy-five were below the age of five years. Of 9,762 persons, who died of this disease in England, in 1837 and 1838, there were 7,340 under the age of five years; 1,668 between the ages of five and fifteen years; 528 between fifteen and thirty; 210 between thirty and seventy; and 16 upwards of seventy years of age. Of 2,285 persons who died of small-pox in London in 1840 and 1841, 2,060 were under fifteen years of age. During the last quarter of the last century (from 1775 to 1800), that is, prior to the discovery of vaccination, the proportion of the mortality by small-pox to the total mortality, was as 8 to 100 in London; and it was probably the same throughout the country. From the commencement of the present century, the proportion has varied much, rising in years when small-pox was prevalent, as in 1838, as high as this, and in other years falling far below it.

92. The susceptibility of infection exists in all persons who have not had the disease, and who have not been vaccinated, but in various degrees: it is greatest in infancy and childhood, and least in advanced age. Dr. GREGORY, however, thinks that this greater mortality from small-pox does not depend upon a greater susceptibility of infection, but because the disease is usually contracted on the first exposure to the infectious miasm. There can be no doubt of this being the case, but it is chiefly owing to the susceptibility being so remarkable at this age. Numerous exceptions have, however, been remarked to this general susceptibility. Both before and after the introduction of inoculation, many persons were frequently exposed to infection without experiencing the disease; and this circumstance, which is common to all infectious and pestilential maladies, was most ignorantly urged by non-contagionists as an argument against the existence of an infectious property; they either not adverting to, or concealing the fact, that many of those who thus appeared quite unsusceptible of infection, had the disease communicated to them by inoculation. "A lady, in 1804, was successfully inoculated for small-pox at the age of 83, and lived several years afterwards. She had brought up a large family, most of whom she had attended in attacks of small-pox, but had never taken it herself." I shall have to show in another place, that the susceptibility which, in vaccinated persons, is destroyed for some years, returns with advancing age, and becomes greater as life advances.

93. *B.* The several causes which predispose the system to the infection of other pestilential maladies, have a similar effect in spreading small-pox. Of these the most manifest are diathesis, or peculiarity of constitution; humid and warm seasons and states of the air; a close and stagnant or impure atmosphere; fear of infection; an endemic or epidemic constitution, favourable to the diffusion or operation of the poison; arrival from a pure and healthy air into a locality in which the malady is prevalent; and the constitution of the Negro and dark races.—*a.* A delicate conformation and susceptibility of the nervous system, a scrofulous or other diathesis existing in families, and exhaustion or depression by previous disease or other causes, either predispose the frame to infection, or render the malady more severe.—*b.* A high range of temperature[*], especially when conjoined with humidity, stillness, and impurities, arising from animal or vegetable decomposition, both predispose the frames of those who are subjected to these causes, and concentrate the poisonous miasm emanating from the sick, and spread this miasm in a wider sphere.—*c.* Fear of being attacked, by depressing vital power, lays the body more open to the invasion, as in all other pestilential maladies.—*d.* There is something in the state of the stationary epidemic constitution which certainly influences variola and other epidemic distempers, and which we are unable to demonstrate otherwise than in the characters of its results; but although the epidemic prevalence of small-pox may be limited to a particular place, or extended over a whole country, either in cold seasons or weather, or in warm seasons and countries, yet it is most severely and generally prevalent in these latter circumstances.—*e.* The constitution of the dark races evinces a remarkable susceptibility of variolous infection. The destructive epidemics which have occurred in warm climates, and in the western world, il-

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[*] BOERHAAVE, one of the ablest illustrators of the pathology of small-pox, states, "Est ut plurimum epidemicus, verno tempore primo incipiens, æstate crescens, languens autumno, hyeme sequente fere cedens, vere iterum eodem ordine rediturus." The truth of this was shown in the course of the Norwich epidemic of 1819, when a few cases only were observed in the preceding winter, and the greatest prevalence and mortality were in June and July. Small-pox was introduced also into the town of Lynn at the commencement of this year, but did not spread with rapidity until summer. A knowledge of this circumstance induces the native inoculators in the East to inoculate the small-pox in the cool season.

lustrate this fact. Although in many of these much may be attributed to the high range of temperature, humidity, and other concurring causes, nevertheless much more should be assigned to peculiarity of constitution, as evinced by the remarkable prevalence and fatality of the distemper when introduced into America among the natives of all climates and localities in that quarter of the globe.

94. *C.* There are certain circumstances, *apart from vaccination*, which influence not merely the susceptibility, but also the character of the malady. Those just mentioned (§§ 91. *et seq.*), whilst they increase the former, have generally a very remarkable influence in augmenting the quantity of the eruption and the severity and malignancy of the distemper. — *a.* The character of the case generating the infection has no influence upon that produced by it, whether the infection has taken place through the medium of the lungs, or by inoculation; a discrete case may occasion a confluent or malignant one, or this latter the former. This may arise from the susceptibility, or constitution, or diathesis of the infected, or from the quantity or concentration of the poison inhaled in a tainted atmosphere. The general mildness of the distemper, when inoculated, may be the result of the small quantity of the poison which may be administered in this way. — *b.* The best state of health, or vigor of constitution, may favour the occurrence of infection, but it will also favour the appearance of a mild form of the disease; whilst unhealthy or cachectic states of the frame, or some pre-existing disorder, may diminish the disposition to be attacked, and yet may render the distemper more severe or malignant when the infection is once produced. — *c.* Certain physical and other influences or circumstances may concur with the first manifestation of disorder to render variola mild, or discrete, or confluent, or malignant. Some of these, especially high temperature and impurity of the air, have been already noticed (§ 93.), as tending to aggravate the malady. Whatever determines the circulation to the surface, as warm baths, cordials, a heating regimen, too many bed-clothes, stimulating diaphoretics, a plethoric habit of body, and external irritants, increase the quantity, or favour the confluence, of the eruption; whilst a cool, dry air, large and well-ventilated apartments, a cooling regimen, and active purgatives taken during the latent period, or at the commencement of the primary fever, diminish the quantity of eruption, determine the circulation from the external surface and lower febrile action. Vascular plethora, especially if accompanied with more or less excrementitial accumulations, favour not merely a confluent or malignant form of the distemper, but many of the complications described above (§§ 44. *et seq.*). Extreme debility, weakness of constitution, and anæmia, delay the eruption, and impress the malady with a nervous or asthenic character.

95. *F. Epidemic visitations* of small-pox observe several of the same laws as govern the recurrence of other epidemic pestilences: — 1st. They return to a locality after a varying number of years, the intervening years presenting merely a few cases. This may, in some measure, be owing to the numbers of susceptible or unprotected cases having become, after many years, so numerous, as to furnish a sufficient supply to an epidemic outbreak; the straggling or few cases usually met with readily extending the infection to the accumulated mass of susceptible persons, as soon as states of air and other influences concur to predispose their constitutions to this result.

96. 2d. These visitations are characterised by greater severity, and are attended by a greater mortality, than when the disease occurs in solitary instances, or when it does not assume an epidemic prevalence: this may be owing to aërial or other causes having predisposed the constitution of susceptible or unprotected persons to severer attacks, and partly also to more concentrated states of the poisonous miasm conveyed by the air from the sick to the healthy. It is thus not uncommon to find persons who have been exposed to the infection of small-pox on ordinary occasions without being attacked, who nevertheless are seized by the disease in the severest form when it is epidemic.

97. 3d. Small-pox epidemics, like others, have a more or less gradual increase, and, when they reach their height, a gradual decrease. The rapidity of progress towards their height and their disappearance necessarily depend upon the population of districts where they break out, upon the numbers of susceptible persons, upon the communications, direct or indirect, between the sick and healthy, upon the observance of segregation, upon the rapidity with which the susceptible are infected, and upon the prevalence of the atmospheric, and other concurring influences to the formation of an epidemic constitution, either in a limited locality or in a more extended sphere.

98. 4th. Small-pox differs from other pestilences, inasmuch as that it may be propagated at all seasons of the year, and in very different atmospheric conditions, although with varying grades of rapidity and prevalence; whereas other infectious pestilences, as I have shown when treating of these, require certain ranges of temperature for their epidemic prevalence, or even for their contingent or possible communication. But small-pox, like scarlet fever and measles, although favoured more or less by temperature and season as these are, may prevail at any season in temperate countries, and more especially in the British Isles, yet the more general and most severe epidemics appear during warm seasons, or when a high temperature and much moisture in the air favour predisposition of constitution and the concentration of the poison. This compatibility of infection with any season and range of temperature incidental to temperate countries, accounts for the circumstance of small-pox, as well as scarlet fever and measles, being a domiciliated malady in these countries, although occurring after longer or shorter intervals in epidemic forms of prevalence and severity, as the numbers of unprotected persons become increased, or as the protection of vaccination wears out.

99. 5th. Epidemic small-pox may be local, owing to local circumstances and influences, as occurred in Norwich in 1819, when, between the months of May and October, about 530 persons died of the distemper within the limits of the bills of mortality, which do not include several parishes in the immediate neighbourhood, where it also prevailed. The limited occurrence of small-pox epidemics is often owing to the combination of morbid influences existing in the locality thus visited. In

Norwich and other places, as Edinburgh, Glasgow, Lynn, Liverpool, &c., where such epidemics appeared, many, if not all the elements of an epidemic constitution already existed, and favoured the spread of the distemper either from isolated cases, or from an introduced infection or fomites.

100. 6th. Not only may persons be seized with small-pox, during its epidemic prevalence, who had previously escaped, although exposed to infection (§§ 95. *et seq.*), but also persons who have been vaccinated, and who, after long periods, have been revaccinated, and even inoculated with small-pox, without effect, may on such an occasion be attacked by variola. This was observed by Mr. Crosse in the Norwich epidemic of 1819, when the protective influence of vaccination may be presumed to have been greater than now, a shorter period having elapsed in most cases since the process was adopted. The small-pox thus following vaccination, after periods of different durations, but generally upwards of seven or eight years, although more or less modified, and commonly modified in proportion to the shortness of the period which had elapsed from vaccination, cannot be mistaken for any other eruptive disease, for, independently of the character of the eruption, inoculation with the matter from the vesicles of the modified malady has produced regular small-pox in the unprotected, as was shown by Mr. Crosse and others. It is chiefly during small-pox epidemics that the protective influence of vaccination is tested, and it is then that the amount and duration of this protection, in connection with proofs of an efficient and healthy vaccination, can be duly estimated. (*See art.* Vaccination.)

101. 7th. As I demonstrated with respect to scarlet fever, when epidemic, that that malady sometimes presented a most dangerous form, in which there was no eruption, and sometimes even no sore throat (*see* Scarlet Fever, §§ *26. et seq.*), so it has been observed that an analogous form of small-pox occurs in some severe epidemics, especially in places where all the elements of epidemic severity concur to produce great malignancy. Thus it is recorded by Mr. Crosse, in his history of the Norwich epidemic of 1819, that a number of cases of fever with petechiæ, but without any variolous eruption, appeared in May, June, and July, when the epidemic was at the worst, and all terminated fatally. The victims were mostly children, enfeebled by scrofula, or some other disease; and as several were thus seized, whilst others in the same family were suffering from small-pox, and as no case of this kind occurred in any one who had previously gone through small-pox, Mr. Crosse ascribed (and, in my opinion, very justly) every case of it to the variolous infection.

102. 8th. Before the introduction of inoculation into Europe, and when variola appeared only in its natural form, the epidemics of it which occasionally appeared, especially when the numbers of the unprotected, by a previous attack, became greatly increased, were often most destructive and pestilential. The outbreaks of small-pox in London in former times frequently carried off several thousand persons in a few months. In 1720, upwards of 20,000 persons were said to have died of it in Paris; and Horstius states that the epidemic visitations of variola "aliquandò adeò sævæ et malignæ sunt, ut instar veræ et legitimæ trucis pestis in omnem ætatem et sexum grassentur et fervirant cum multorum jacturâ et perditione;" and that, in 1614, it ravaged most of the countries of Europe more destructively than the plague, "in summâ nulli parcentes regioni, unius anni curriculo totam Europam seriatim visitârunt atque enormiter depopulârunt." It may readily be conceived that, when the distemper appeared in a district or city, after an absence of many years, when the greater number of the inhabitants were unprotected, its spread would be rapid and its ravages great. The mortality in the epidemics which occurred previously to the introduction of inoculation must have been very great, when we consider the efficient and concurrent elements of epidemic prevalence and fatality which every where existed in those times, and the nature of the treatment generally adopted. Even in recent times, the proportion of deaths to the number attacked by natural small-pox in several epidemic visitations of the distemper has varied from one in six to one in four.

103. 9th. *The possibility of persons being attacked by small-pox a second time* has been contended for by many, and doubted by others, as Mead, Heberden, Monro, De Haen, &c. De la Condamine estimated second attacks as one in ten thousand. Whilst admitting the possibility of a second attack, I doubt if its occurrence be even so frequent as here estimated. It is only when the disease is epidemic, and the exposure to the infectious miasm has been prolonged, or the poison has been concentrated in the respired air, that it may occur. Dr. Gregory states that very few persons ever present themselves at the Small-pox Hospital who have affirmed that they had previously undergone the disease; and of these few, but a very small fraction can stand the test of rigid scrutiny. In one of the last cases that occurred, the medical man who witnessed the first seizure had misgivings as to the true nature of the case. No instance is recorded of the same person having been admitted twice at the Small-pox Hospital. As to second attacks of variola, there are several sources of error. Sometimes the first attack is incorrectly reported, sometimes the second. The same medical man very rarely has seen both attacks. Chicken-pox is very frequently mistaken for variola, and even psora, ecthyma, and even pustular syphilis, have given origin to mistakes. The case of recurring variola which made the greatest noise was that of Louis XV., who died of small-pox in 1774, at the age of 64, after having, as it is alleged, undergone that disease casually in 1724, when 14 years of age. But the physicians who attended him in this first attack were not agreed as to its having been small-pox; and it was known that he was abroad and well six or seven days after the eruption was out, further evincing the non-variolous nature of the attack. I therefore agree with Dr. Gregory in believing that the primary disorder which his majesty had was varicella.

104. VIII. Of the Inoculation of Small-pox. — Inoculation having been abolished by Act of Parliament, and the end held in view having been more satisfactorily obtained, as generally supposed, by having recourse to vaccination, it may appear unnecessary to many to make inoculation of small-pox a topic of discussion at this time. Yet when all the evidence connected with

the comparative merits of inoculation and vaccination in temperate and warm climates, and in different races of the species, is duly considered, some notice of this still not unimportant topic should not be omitted. At the time of my writing this, just half a century has elapsed since the discovery and introduction of vaccination; and after a quarter of a century of most transcendental laudation of the measure, with merely occasional whisperings of doubt, and after another quarter of a century of reverberated encomiums from well-paid vaccination boards, raised with a view of overbearing the increasing murmurings of disbelief among those who observe and think for themselves, the middle of the 19th century finds the majority of the profession, in all latitudes and hemispheres, doubtful as to the preponderance of advantages, present and prospective, to be obtained either from inoculation or from vaccination. In 1823, I stated in the *London Medical Repository* (see the Refer., &c.), from evidence which had come before me in families which had suffered in numbers from small-pox, that the protection afforded by vaccination was impaired by years, and wore out in twelve or fourteen years, or in a longer or shorter time, according to diathesis, &c. — that vaccinated persons were liable to small-pox, in a more or less modified form, after some years, say nine or eleven; in a mild but distinct and fully developed form in from twelve to fifteen years, and to the usual states of the distemper, according to diathesis, to exposure to infection and epidemic prevalence, after this more advanced age. What was then predicted has since been so generally fulfilled, that revaccination has been adopted in many places, and has often failed, natural small-pox having notwithstanding appeared in the revaccinated, — both in those in whom the measure appeared to have succeeded, and in those in whom it failed.

105. Thus half a century has brought us to the position that we are doubtful which to prefer, — vaccination, with its present benefits and its future contingent dangers, or inoculation, with its possible present dangers and its future advantages. If there were no other considerations, but these which could be seriously raised in connection with the inoculation of variola, I should, for my own part, and after a due consideration of the subject in its various bearings, be at no loss which to select for those for whom I feel the interest connected with the nearest relationship; but there is the contingent and not improbable diffusion of the variolous poison to the unprotected by inoculation to be taken into account; and there is obedience also to the laws, which is the duty of every good citizen, and is strictly observed by every well-educated physician, although systematically disregarded and trespassed by pretenders and irregular medical practitioners. Another half century, the end of the 19th century, will, I fear, find the physician no longer in doubt as to which he will choose, even in this climate, as he no longer can be in doubt in India and other parts of the East, and as respects the dark races, unless he be influenced by authority and prejudice, — influences which are equally unworthy the high position in which his profession places him in the estimation of those whose opinions alone deserve respect and consideration.

106. *Inoculation of small-pox* is the artificial insertion, beneath the cuticle, or in a wound or puncture, or the application on an abraded surface, of a person not previously attacked by small-pox, of a minute portion of the virus formed in the vesicles or pustules of one labouring under the malady. By this mode of communicating the malady, the system is generally infected by the smallest quantity of the poison capable of producing this effect. In the East, inoculation has been practised successfully, and in a rational manner, from a remote period — as remote as the history of the disease carries us. The following arguments have been adduced in favour of it, and previously to the discovery of vaccination powerfully recommended it; and even now they should be calmly weighed against the advantages of vaccination, as far as these have been yet ascertained, and as they may be valued prospectively.

107. (*a.*) All persons not protected by an attack of small-pox are liable to be seized with this distemper at any period of life, in every circumstance in which they be placed, and on any occasion. It therefore behoves them to obtain this protection as early as may be consistent with a safe and efficient recourse to it. Now this protection was formerly inoculation; more recently, and at present, the only legal protection is vaccination. The former communicated a milder form of the same disease as a certain protection; the latter transmits an affection, of a slight and by no means dangerous nature in itself, which is somewhat similar in certain respects, and which has the virtue of preventing an attack of small-pox for some years, and of rendering such attack milder in grade, and modified in character, for an indefinite period; this protection, however, is not durable, but terminates after an indefinite number of years; in some instances entirely exhausting itself, and leaving those who may consider themselves protected open to either a mild and modified, or a confluent, severe, or even fatal attack of the malady.

108. (*b.*) The individual and collective evils resulting from the infection of natural small-pox, whether appearing in scattered or rare cases, or breaking out with pestilential prevalence, are well known. The history of small-pox epidemics, as observed in communities furnishing numbers of unprotected persons, sufficiently demonstrates the devastation which followed the entire want of any protecting power, before the introduction of inoculation into Europe. When this protection was introduced, its influence was manifest, not only in respect of the persons who had recourse to it, but also as regarded the community, in diminishing the frequency and fatality of epidemic small-pox, and in furnishing protected persons to attend upon the infected. Still there was a certain amount of evil connected with this mode of protection. The chance of communicating a dangerous or even fatal malady, and the contingent propagation, from the inoculated individual to the unprotected, of this disease, dismayed many, and furnished arguments in former times against having recourse to it. When weighed in connection with the fact, that some few entirely escape small-pox during their whole lives, although these were admitted to be very few, many were induced entirely to neglect this mode of protection, and, in more recent times, to adopt a

milder method, and one which appeared to the public and to the profession, until lately, equally efficacious and permanent.

109. The chief objections here urged against inoculation were partly specious and partly just. Inoculation practised by ignorant, unskilled, and unprofessional hands, in improper seasons, ages, and circumstances, or with a total disregard of the states of health of those subjected to it, may occasionally be followed by dangerous or even fatal results. Nevertheless it has been shown that, with all these drawbacks, and without the precautions, the science, and the care, which the educated physician can employ, the proportion of deaths amongst the inoculated does not rise above 5 in 1000. That inoculation would spread the distemper is certainly true when a few only resort to it; but even such diffusion would prevent the recurrence of those pestilential epidemics which follow the accumulations of a great number of unprotected in one locality, and would diffuse the disease in a milder form than when it occurs epidemically; for it has been fully proved that infection from the inoculated distemper generally does not communicate so severe or dangerous an attack as infection from a natural and epidemic case. Besides, if inoculation were generally adopted at a proper age, there could not possibly be the pabulum for an epidemic outbreak, and scarcely the occurrence of a natural case.

110. (*c.*) Against this admitted amount of unfavourable contingency, must be placed the firm confidence of protection, which inoculation furnished to all persons, in all climates, and to all races within the tropics, and to the dark varieties of the species. In these climates and races, vaccination (which the law has made to supersede inoculation) has been demonstrated to be inefficacious; but in all these circumstances, however diversified or opposite, inoculation has been found, and still is found, the most certain protection from the severer distemper and from epidemic outbreaks.*

111. (*d.*) Several *unfavourable contingencies have been urged against inoculation*; but certain of these need not be apprehended. That this measure may communicate a severe, a disfiguring, or even a fatal malady to a person who may entirely escape it if inoculation were not performed, must be admitted; but this argument was without weight before the introduction of vaccination, and now the advantages of the one mode of protection should only be weighed against the other with the view of adopting either of them, for the neglect of both is manifestly not merely improper but even criminal. It has been urged that inoculation may not only be followed by a dangerous attack, but that it may develope other maladies, especially severe affections of the eyes, terminating in blindness, and diseases of various organs; but these would more certainly follow the natural infection of small-pox, which, without either inoculation or vaccination, could very rarely be avoided. To these contingencies vaccination is certainly not liable; but it should not be overlooked that scrofula and tubercular formations are more frequently observed after vaccination than after inoculation (see *art.* Scrofula, &c., §§ 48, 49.). The risk of a second attack after the inoculated small-pox has been urged; but this risk hardly exceeds a possibility, and should not be taken into account; the risk of being attacked after vaccination, or even after revaccination, being infinitely greater, especially during adult and advanced age. (See *art.* Vaccination.)

112. (*e.*) It has been urged by Dr. Baron and others, who are the most determined supporters of vaccination, that "the practice of inoculation, the greatest improvement ever introduced in the treatment of small-pox, although beneficial to the person inoculated, has been detrimental to mankind in general. It has kept up a constant source of noxious infection, which has more than counterbalanced the advantages of individual security." (*Life of Jenner*, vol. i., p. 260.) This is true only to a certain extent; for if all were inoculated early in life (as by law might be enforced) there could be few or none liable to the natural infection and epidemic visitation of the malady; and according to the numbers unprotected would be the risk of such infection and visitation. Inoculation, although practised the most during the last half of the 18th century, was nevertheless as often neglected or put off, until it was too late to prevent the natural infection, and hence all reasoning respecting it became inconclusive, especially in local and other circumstances, respecting which the particulars were either imperfectly known or altogether unknown.

113. Sir G. Blane has endeavoured to show that the proportion which the mortality by small-pox in London bore to the general mortality increased during the last century from 78 to 94 per thousand; and that the diffusion of small-pox by inoculation was more strongly exemplified in the country than in London; since there are many places where small-pox was not known for twenty, thirty, and even forty years, in which at present scarcely an adult can be found who has not had it. These arguments are, however, more specious than solid. For, as respects London, the increase of population, the diminished prevalence of all other diseases, and the prevalence of epidemic small-pox, are not duly estimated. From 1711 to 1740, when there was no inoculation, the deaths by small-pox were 65,383; from 1741 to 1770, when inoculation was coming into use, the deaths were 63,308; and from 1771 to 1800, when inoculation was the most frequent, the deaths were 57,268. The increase of population during these periods should not be overlooked. As to the escape of many places for many years, upon which Sir G. Blane has laid so much stress, it should be known, that such places were always

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* Between December 1849 and April 1850 inclusive, 76 cases of small-pox were admitted into the General Hospital, Calcutta. Of these 20 died. Of the 76 admitted, 66 had been vaccinated. Of the 66 vaccinated, 41 had good cicatrices, and 25 had cicatrices not so well marked. Of the total 76 cases, 30 were severe and confluent, 46 mild or modified. Of the 10 unprotected cases, 5 were severe and confluent — of whom 4 died — and 5 were mild. Of the remaining 25 confluent cases, after vaccination, 12 had good cicatrices, and 13 cicatrices not so well marked. Of those that had been vaccinated in early life, 16 died, of whom half bore good scars, and half had scars not well marked. Of the whole number, 65 were males, 11 females; 8 were children aged five years or under, of whom 1 died. Six of these children had been vaccinated. The mortality here stated as occurring from variola after vaccination — 16 out of 66, or 24 per cent. — is the highest upon record in any country, and must be attributed either to the malignity of the prevailing epidemic, to the climate and locality, or to the influence of race, — probably in part to all these.

visited at last, and without exception, by most destructive epidemics, the great number of the unprotected furnishing an abundant papulum for their malignant and fatal prevalence. It becomes, therefore, much preferable to have, even in these places, the regular adoption of inoculation by qualified persons, with even the highest rate of mortality consequent upon this measure, than the immunity of many years, with a mortality of 25 or 30 per cent, as recorded of these epidemics.

114. There can be no doubt that early in, and about the middle of, the last century, when inoculation was adopted only by a few, and even afterwards, when inoculation was very irregularly practised, and when many, even the majority in many places, were left without that protection, that it multiplied the sources of infection; but this was merely a powerful argument then for universal inoculation, as it is now for the adoption either of vaccination or of inoculation, if the latter were allowed by the legislature. On this subject, as will more fully appear when vaccination comes under consideration, writers have been partisans, rather than calm examiners of facts, as formerly or at present observed, and as faithful expositors of what may rationally be expected.

115. *There are a few rules requisite to the safe conduct of inoculation* that ought to be observed: — 1st. This measure should be employed for persons in good health — in those who are neither debilitated, nor plethoric, nor obviously scrofulous. Debilitated persons should previously be restored to health, and the plethoric reduced by moderate evacuations and active exercise. All the secretions and excretions ought to be natural and free; and wherever a cachectic state of system, or indications of visceral congestion or obstruction exist, inoculation ought not to be performed. 2d. It may safely be practised at any age from three months and upwards, but it should not be resorted to during pregnancy and the puerperal states, on account of danger to the mother and child, nor during lactation. 3d. It may be practised at all seasons in temperate countries, and in all climates. The preferable season is that which is moderately cool, and admits of due ventilation of the patient's apartment. In warm climates, the coolest season of the year should be selected; and this season has always been selected by native inoculators in the warm climates of the East, where inoculation has been adopted from early ages. 4th. Inoculation is successful, compared with the natural distemper, in all races and climates, but more especially in the dark races, and in tropical countries; for, although the proportion of deaths after inoculation may be higher in the dark than in the white races, the protection furnished by it is even greater in the former than in the latter, natural small-pox being so remarkably destructive in all dark races.

116. That variolous inoculation by unqualified persons ought to be prevented by legislative enactment cannot be disputed; but there are circumstances which may render recourse to it, under due precautions, a justifiable measure, especially the following: — 1st. When small-pox unexpectedly breaks out in a district, at a time when vaccine virus is not to be obtained. 2d. When persons who have been vaccinated in infancy are about to proceed to inter-tropical climates, and are likely to visit places where small-pox either prevails or recurs epidemically. 3d. Among the dark races, when they will not adopt vaccination, or when the vaccine virus is inefficient, either as respects its local effects, or its protective power. 4th. When persons are insusceptible of vaccination, from peculiarity of constitution, or some other cause.

117. In the present state of our knowledge as to the protection furnished by vaccination — believing that this measure will never be generally adopted, and that, if it were so adopted, it could never altogether banish small-pox, nor prove a complete or lasting preventive of variolous infection — it becomes doubtful whether or no the amount of benefit conferred by vaccination will hereafter prove greater than would be furnished by the general adoption of inoculation: as respects inter-tropical climates and the dark races, the candid inquirer into the merits of both will ere long, even if not now, declare for the latter. As inoculation is still practised in some countries, as it is still in many climates preferred to vaccination, and as it is the measure to which the majority of persons above forty years of age owe their protection from the natural distemper, the more important particulars connected with its performance require to be stated; and I cannot do this better than nearly in the words of Dr. GREGORY: —

118. *Inoculated small-pox.* — Inoculation is performed by introducing into the arm, at the insertion of the deltoid muscle, by means of a lancet, a minute portion of variolous matter. The thin lymph of a fifth-day vesicle is to be preferred to the well-concocted purulent matter of the eighth day, but both are efficient. One incision only is to be made. A minute orange-coloured spot is perceptible on the second day, by aid of the microscope: on the third or fourth day, a sensation of pricking is felt in the part. The punctured point is hard, and a minute vesicle, whose centre is depressed, may be observed, surmounting an inflamed base. On the fifth day, the vesicle is well developed, and the areola commences. On the sixth day, the patient feels stiffness in the axilla, with pain. The inoculated part has become a hard and inflamed phlegmon; the subjacent cellular tissue having become involved in the inflammatory action. On the evening of the seventh, or early on the eighth day, rigours, headache, a fit of syncope, vomiting, an offensive state of the breath, alternate heats and chills, languor, lassitude, or, in the child, a convulsive paroxysm, announce the setting in of fever. The constitution sympathises with the progress of the local disorder, and the virus has affected the whole system.

119. On the appearance of febrile symptoms, the inflammation of the *inoculated part* of the arm spreads rapidly. An areola of irregular shape is soon completed, which displays within it minute confluent vesicles. On the tenth day, the arm is hard, tense, shining, and very red. The pustule discharges copiously, and ulceration has evidently penetrated the depth of the corion.

120. On the eighth day, spots of variolous *eruption* begin to show themselves in various, and often in the most distant parts of the body. In the majority of cases, the eruption is distinct and moderate. Two hundred vesicles are counted a

full crop. Sometimes not more than two or three papulæ can be discovered, which perhaps shrivel and dry up, without going through the regular process of maturation. In other cases, the eruption is full and semi-confluent, passing through all the stages to maturation, and scabbing, and cicatrisation, with as much perfection as the casual disease can display. Between these extremes every possible variety may be observed. The truly confluent eruption, with affection of the mucous surfaces, is very rare, and that implication of the fluids and of the nervous system, which together constitute the extreme of variolous malignity, is nearly, if not entirely, unknown. Secondary fever, therefore, is not common, at least in any intensity.

121. IX. Treatment. — Small-pox being a specific disease, of a determinate course as respects both the eruption and the febrile phenomena characterising it, is less amenable to treatment than most other acute diseases. Nevertheless rationally-devised means exert considerable influence on the course of the distemper. In many cases, little or no interference on the part of the physician may be required, but something is always expected from him when his aid is called in, and it should, therefore, be clearly known what measures may be injurious and what beneficial. In severe cases, however, medical aid is always more or less requisite and advantageous, but to be the latter it should be based upon sound pathological views, and upon an accurate recognition of existing morbid states. Dr. Gregory justly remarks, that "it is a melancholy reflection, but too true, that for many hundred years the efforts of physicians were rather exerted to thwart nature, and to add to the malignancy of the disease, than to aid her in her efforts. Blisters, heating alexipharmics, large bleedings, opiates, ointments, masks and lotions to prevent pitting, were the great measures formerly pursued, not one of which can be recommended." We may smile at the red bed-hangings, the red blankets and counterpane, the mulberry wine, the juice of pomegranates, prescribed for the malady by John of Gaddesden; "but if either he or Gordonius or Gilbertus were to rise from their graves, and inquire whether this is one whit worse than mesmerism, or at all more absurd than homœopathy or hydropathy, we should, I fear, look a little foolish. Let us, then, avoid the errors of our ancestors, without reproaching them."

122. Even in more recent times, and down to the days of Sydenham, or even to those of Van Swieten and Heberden, physicians have entertained very erroneous notions as to the powers of medicine in small-pox, and as to the intentions by which they should be guided. They imagined that certain drugs possessed the power of promoting the eruption, and not only of promoting it, but of procuring a favourable sort — a power, however, which was much more frequently injurious than beneficial; and, as far as it was manifested, much less rational and serviceable than the means employed for ages in the East in the treatment of small-pox. In this disease, we remark, as in several others, that the boasted powers of doctrinal science, when not fully advanced, are often more prejudicial than beneficial, especially when blindly adopted, and applied without the guidance of rational observation.

123. The treatment of small-pox should be directed with similar *intentions* to those recommended for the management of other fevers. Means should be employed, 1st, to moderate febrile phenomena, whenever they are severe or excessive; 2d, to prevent or remove local determinations or congestions of blood, or other concomitant affections or structural changes; and, 3d, to support the powers of life, whenever they are inordinately depressed or exhausted, by the influence of the morbid poison on the nervous and circulating systems. These *indications* should never be overlooked in any form, stage, or state of the malady. In the mild or distinct form, the active adoption of them may not be required; yet even in it, the occasions which may demand their due observance should carefully be watched for, and promptly met when observed.

124. *A. The primary or initiatory fever* may not be recognised as that of small-pox in cases occurring independently of inoculation, or without obvious sources of infection, and in these the treatment of this stage must be conducted according to the principles developed under the treatment of continued fever (see *art.* Fever, §§ 126. *et seq.*). If, however, it be known, or strongly suspected, that the incipient disease is small-pox, the question arises, shall there be any difference in the treatment to be adopted from that usually employed in continued fever? But, as it is in continued fever, so it is in small-pox, the febrile action, the type and character of the fever, may vary from inflammatory to adynamic, or even putro-adynamic, and display in the latter, as I have shown in respect of the former, not merely either extreme of type, but every intermediate phase. The treatment of this period, therefore, must necessarily depend upon the states of the pulse and of the general phenomena, in connection with existing evidence of vital power; and upon the acumen and capability of the physician in recognising with precision these various and varying states, and in controlling or guiding them to a successful issue. As remarked by Sydenham, the fate of the patient depends upon the treatment of this stage, — that is, of the first three days of the disease.

125. The patient should be removed to a large and airy chamber, which ought to be darkened and well ventilated. He should be laid on a hair mattress, and be covered by a moderate quantity of bed-clothes, his head resting on a hair pillow, as being more cool than that in common use. The temperature of the room should be, according to the amount of febrile heat, from 55° to 65°, but preferably from 55° to 60°. If the disease be distinct, and the febrile symptoms not very severe, the patient may not be confined to bed during the day, his clothing being appropriate to the circumstances in which he is placed. A dose of calomel with James's powder, or antimonial powder, should be given, and be followed, three hours afterwards, by a purgative pill or draught. After these, saline draughts in a state of effervescence may be prescribed from time to time, and the bowels preserved in a moderately open state by the usual cooling aperients. In the slighter forms of the disease, no further medicine will be required; the beverages, diet, and regimen of the patient being regulated as stated hereafter.

126. If the primary fever assume a more severe

and inflammatory character, and if the pain in the head, epigastrium, and loins, be too severe to be allayed by the above means, and more especially if the patient be robust or plethoric, blood should be taken from the arm, in such quantity as the peculiarities of the case may warrant, in addition to these means. When the brain, lungs, or liver is congested, or the pulse full, hard, oppressed, or sharp, a moderate bloodletting, relatively to the state of the patient, ought to be prescribed; and this measure will be still more requisite when the headache is intense, the face flushed, and the vessels throbbing, the irritability of stomach extreme, the breathing oppressed, and the pulse full and labouring. When the eyes are suffused, and headache is experienced, leeches applied to the temples, or behind the ears, may be sufficient; or, in the more phlogistic cases, they may be employed in aid of bleeding from the arm, and be followed by calomel, James's powder, a purgative draught or pill, and cooling draughts. Dr. **Gregory** remarks, that "it has often been said that bloodletting, in the fever of invasion, interrupts the process of nature, repels the eruption, or so retards it, and so weakens the constitution, that the due concoction of the pustules is never effected. It is undeniable that a man may be bled unnecessarily and too largely in small-pox, but a moderate bleeding does no harm, and, if the fever runs high, often does great good." The propriety of having recourse to venesection, especially in the circumstances just mentioned, has been insisted on by **Sydenham**, **Biendisant**, **Torrini**, **Dover**, **Berger**, **Stubbes**, **Falconet**, and many others. **De Valdes** recommended bloodletting nearly a century before **Sydenham**; and **Hecquet** advised bloodletting from the feet at this stage. **Hufeland** very properly directed leeches to be applied to the temples when the disease was attended by convulsions. The quantity of blood to be drawn should depend upon the state of the pulse and other peculiarities of the case, always keeping in recollection the character of the prevailing epidemic and of physical influences.

127. *a. Emetics* have been advised by some writers on the invasion of the primary form of small-pox, and condemned by others. The propriety of having recourse to them depends upon the peculiarities of the case, the character of the epidemic and the season in which the distemper occurs. **Sydenham** prescribed an emetic, after bloodletting, in the primary fever, and in the secondary fever with internal complication. He likewise had recourse to it as soon as the disease appeared to be confluent. But there appears to have been much vacillation in his opinions as to both emetics and bloodletting in small-pox at different epochs of his practice, or rather during the different epidemic prevalences of the malady, as shown by his brief accounts of several epidemics; and I cannot depend so firmly upon the opinions of a physician, as many are disposed to do, who did not perceive, or duly estimate, the contagious and infectious nature of the malady. That emetics are often of service, especially at the commencement of the primary fever, and when indications of biliary obstruction, congestion, or accumulations are present, and during autumn or summer, I cannot doubt; but it requires close observation and experience to determine with precision the exact circumstances and period of the malady requiring their exhibition. They have been recommended by **Dedekind**, **Hecquet**, **Leake**, and many others, but in a too empirical manner, and with little regard to either the peculiarities of the case, the stage of the malady, or the choice of the agent. A writer in the Berlin Medical Transactions advises repeated emetics in this disease. The effects of one, however, will show the propriety of having recourse to it, and likewise of repeating it. In the low, adynamic, or confluent states of the disease, more especially, the choice of the agent is of some importance; for in these states, the more nauseating or depressing emetics, as tartar emetic or ipecacuanha, are not so appropriate as in the sthenic forms of the malady, unless they be conjoined with stimulants, aromatics, &c. In the former states the sulphate of zinc should be preferred. Some writers suppose that emetics diminish, others that they increase, the quantity of eruption; but it may be said of emetics, as of bloodletting, that they have little or no effect upon the eruption, or in lessening confluence. Their influence is exerted chiefly in promoting the excreting functions, whilst bloodletting diminishes inordinate vascular action, and relieves internal oppression and congestion.

128. *b. Purgatives* are generally beneficial during the primary fever, and very often also in the secondary fever; but they are required more especially when the secretions and excretions have not been duly evacuated previously to treatment, when the indications of local determinations, particularly to the head, are manifest, and when sthenic febrile excitement is considerable. In these circumstances, not only purgatives, but the whole of the *antiphlogistic regimen*, as insisted on by **Sydenham**, **Hoffmann**, **Van Swieten**, **Bartholinus**, **Dimsdale**, **Currie**, **Eyerel**, **Beddoes**, **Perkins**, &c., are beneficial. Much, however, depends upon the selection and combination of these means appropriately to the peculiarities of the case. In the primary fever, *calomel* is generally most serviceable, especially when conjoined with antimonials in the more sthenic forms of the disease, and with camphor in the more asthenic; but in most cases, a full dose of the calomel should be followed by a purgative draught in a few hours, if it have not operated sufficiently. Dr. **Fowler** supposed that, when calomel was given early in the eruptive fever, it diminished the quantity of eruption. But it cannot have this effect, unless it be taken before the first indications of eruption exist, and then its influence must be necessarily doubtful.

129. **Osiander** very justly cautions against too much purging; for it may develope an intestinal complication, in the form of either diarrhœa or dysentery, and thereby greatly endanger the patient. In the more inflammatory or sthenic cases, the phosphate of soda, the citrate of magnesia, or other cooling saline purgatives, should be preferred, or such as may be compatible with the use of saline diaphoretics, as the liquor ammoniæ acetatis and spiritus ætheris nitrici; but in asthenic or confluent states of the disease, after a dose of calomel or camphor, I have preferred to give the spiritus terebinthinæ, with about an equal part of castor oil, on the surface of a suitable vehicle, in quantity sufficient to act moderately on the bowels. If this dose be rejected, the

effect will, notwithstanding, be more or less beneficial, and after some hours it should be repeated, or the same substances in larger doses should be administered in an enema, which may be repeated according to circumstances.

130. During the primary fever, pain at the epigastrium is often considerable, or even urgent, and is frequently accompanied with irritability of stomach, and the rejection of whatever is swallowed. It may be requisite, from the severity of these symptoms, to endeavour to abate them. This object will be most readily attained by giving a full dose of calomel with a moderate dose of camphor and opium, and a little cinnamon or ginger, in the form of bolus, or in that of powder mixed in a little treacle. In these circumstances, saline effervescing draughts, with or without tincture of opium, generally fail of giving relief. If the disease presenting these symptoms is of an asthenic or confluent kind, as commonly observed, or if the medicine now recommended is not sufficiently efficacious, a mustard poultice may be applied over the epigastrium, or a mustard pediluvium or semicupium may be employed. In most cases I have preferred, to the mustard poultice, the application over the epigastrium of equal parts of the compound camphor liniment and of the turpentine liniment, with a little cajuput oil, and sometimes with a little olive or almond oil, on the surface of flannel or spongio-piline.

131. *c. Cooling diaphoretics*, especially small or moderate doses of the solution of the acetate of ammonia, or of the citrate of ammonia, or of the citrate of magnesia, or of the citrate of soda or potass, with the spirit of nitric ether, according to the states of the surface and of the bowels, will generally be of service; and the acid may be somewhat in excess when vascular action is inordinate. Cold sponging the surface, during the early part of the primary fever, or even the cold affusion, may be resorted to, as advised by Bartholin, Currie, Beddoes, Jackson, and others; but when the eruption appears, these should be relinquished, for I believe that the recommendation of Schaeffer, Swainson, Hufeland, Watson and Selle not to employ these means at this period is altogether judicious. Marcard considered, and with much reason, that the tepid bath, previously to the appearance of the eruption, moderated the primary fever; and he recommended warm stimulating baths in the low and retrocedent states of the distemper. Many of the writers already named cautioned against carrying the cooling regimen too far, or employing excessive cold, in the treatment of low, confluent, or epidemic states of the disease, justly contending that a moderately cool or fresh state of the air, and a judicious recourse to restoratives or tonics were altogether indispensable in many cases, and especially in the epidemic prevalences of the malady. The treatment which appears the most appropriate to these cases will be hereafter stated (§§ 143. *et seq.*).

132. Dr. Gregory justly remarks, that "if the circulation at this period (the primary fever) be languid; if the pulse be small and feeble, the skin pale, and the extremities cold; if the patient lies on his back, sunk and exhausted, let him have immediately warm brandy and water, cover him with bed-clothes, apply mustard poultices to the centre and extremities of the circulating system, and give thirty drops of laudanum, to be repeated in four hours if necessary. This cordial plan of treatment must often be continued for several days, when the eruptive nisus is accompanied with depression, and nature appears so obviously unequal to the effort." (*Op. cit.*, p. 100.) In these circumstances, the opium should be given with camphor or ammonia, or both; and the hot terebinthinate epithem will generally be more efficacious than the mustard poultices.

133. *B.* During the progress of the eruption, and in the *remission of the fever* which produced it, but little beyond a suitable regimen is required. A too officious recourse to medicine is oftener prejudicial than the contrary. The same remark applies to the secondary fever, or suppurative stage, when the disease is discrete and there is no complication. During the period of eruption and development, however, the secretions and excretions should be carefully watched and cautiously promoted, without producing irritation; and the senses and mind ought to be guarded against excitement, very light and bland beverages, and mild, weak, farinaceous nourishment, in small quantity only, being allowed. Dr. Gregory's remarks as to the treatment of this stage are so judicious, that I shall adduce them at this place.

134. "While the pustules are in process of maturation, a variety of measures may be pursued, which, without interrupting the salutary and necessary process of pustulation, lessen the patient's sufferings, and prevent subsequent difficulties. If the eruption proceeds favourably, you would not do more than lessen thirst by saline draughts, and occasionally relieve the bowels by a dose of castor oil. If the maturation of a large crop of pustules excites much fever, it will be prudent to employ more active purgatives, such as calomel with colocynth, the compound powder of jalap, or the infusion of senna with salts, all which cause a drain from the blood-vessels and lower arterial action. Place the patient in a large and cool room, and cover him lightly with bed-clothes. Remove all flannel coverings which may usually be worn next the skin. If the surface be very tender, apply to it some cooling lotion, such as the decoction of bran with some spirit of rosemary. In all cases, even of moderate intensity, it is proper to cut the hair close, and so to maintain it during the whole course of the disease. The head is thus kept cool; delirium is relieved or prevented; the risk of cellular inflammation of the scalp diminished, cleanliness enforced, and an opportunity afforded for the employment of evaporating lotions, should more urgent symptoms arise. Opiates may be occasionally administered at bed-time, when there is much cuticular irritation, or great distress from want of sleep.

135. "The diet of the patient should consist of tea, bread and milk, arrowroot, rice-milk, and roasted apples. Grapes, oranges, and ripe subacid fruits are grateful to the patient, and useful adjuvants to the antiphlogistic remedies. Lemonade, apple-water, tamarind-water, toast-water, and milk-and-water, must be the ordinary beverages. Sydenham permitted his patients to drink small-beer — an indulgence which may still be granted. To that able physician we are indebted for this, the cooling system of treatment in small-pox.

136. "One of the first objects, which, in cases of more urgency, will attract your attention, is the condition of the throat. Gargles of infusum

rosæ comp. afford some relief. When the difficulty of swallowing is very great, and the tonsils much swollen, leeches applied to the throat, followed by poppy-water fomentations, are serviceable. Under these circumstances, some physicians counsel you to apply to the throat, by means of a camel-hair pencil, a strong solution of lunar caustic (twelve grains to the ounce), with the view of checking the advance of the mucous vesicles. I have not adopted this practice, from a conviction that it would not affect the tracheal inflammation, from which alone danger is to be apprehended." (*Op. cit.*, p. 101.) More recently, much stronger solutions of nitrate of silver — from forty to sixty grains to an ounce of distilled water — have been applied to the pharynx, inside of the glottis, and even within the larynx and upper part of the trachea, by means of a sponge attached to whalebone; and, it is said, with success in some cases. Chlorinated lotions and gargles are generally of use when the affection of the throat and nasal passages is severe in confluent small-pox.

137. *C.* During the *secondary fever*, when it is severe or complicated, the treatment should be active but discriminating. The use of *purgatives* at this period was once a question of warm discussion. Dr. GREGORY remarks as follows:— "One of the most remarkable disputes which ever arose in physic was that regarding the propriety of using purgatives during the secondary fever of small-pox. SYDENHAM, with all his boldness, never wholly divested himself of the early prejudices which the Arabians had inculcated against purgatives in small-pox. MORTON inveighed bitterly against their use, while Dr. FRIEND, with the true spirit of a reformer, advocated their free employment, especially during the secondary fever." "They are now as freely employed in the secondary fever of small-pox as in ague or in typhus. They are of the greatest service when the skin is hot and dry, when a scarlatinal rash covers the body, or innumerable abscesses give evidence of the excited state of the cutaneous vessels."

138. Agreeing with the foregoing remarks, I would add only that, when too strong, or too frequently exhibited, purgatives may induce a dangerous diarrhœa or dysentery, or an enteric complication, especially if the selection of the means be not sufficiently discriminating in respect of the peculiarities of the case. As long as the disease manifests but little exhaustion of vital power, this care may be of less importance; but when vascular action is asthenic, and constitutional power is depressed, then such aperients as promote excretion, and, at the same time, impart tone or energy, should be preferred. Such are the means advised above (§§ 128, 129.), and such also are the compound decoction of aloes, or the compound infusions of gentian and senna, given in conjunction with the carbonates of the alkalies and aromatic tinctures, or with the citrate of magnesia, or with the carbonate or citrate of ammonia. In many cases, it may be requisite to aid the operation of these by means of enemata containing the substances already mentioned, with such others as the exigencies of the case will suggest.

139. The propriety of *bloodletting* in the secondary fever has been denied by most writers, and contended for by others, but by these latter under certain circumstances only. SYDENHAM, when he first wrote on small-pox, advised bloodletting in the secondary fever of the confluent disease alternately with purging; but at later periods of his practice, and when describing the epidemics of 1670 and subsequent years, which were manifestly of a most malignant character, the treatment recommended by him was of a very different kind (§§ 147, 149.) from that formerly directed. It would seem that the small-pox previously to 1665 and 1666, that is, before the great plague, was of a more sthenic nature than subsequently; and that, after this most fatal epidemic, by which about 100,000 bodies were buried in a few months within and immediately around London, thus furnishing additional sources of contamination to both air and water for many years afterwards, small-pox and other febrile diseases presented a more malignant character, and required different means of cure from those formerly employed.

140. When the pulse presents more or less tone, and vascular action is high, in connection with internal complication — congestive or inflammatory — then bloodletting, cautiously and moderately employed, according to the peculiarities of the case, and aided by such means as may derive the fluids from the seat of complication, and promote excretion, &c., will prove of much service. But if the pulse be weak, very quick, compressible, or small and soft, and, more especially, if there appear any signs of putro-adynamia or malignancy, as respects either the state of the eruption or the constitutional symptoms, decided means of an opposite kind are obviously indicated (§§ 143. *et seq.*).

141. In the secondary fever, when uncomplicated with any *internal affection*, or *contamination* of the circulating fluids, little beyond the preservation of a free state of the secretions and excretions need be attempted; aided, however, by a suitable regimen. In cases presenting prominent affection either of the brain or its membranes, or of the lungs, pleura, &c., general or local bloodletting, or both, according to the peculiarities of each case, is generally requisite; and purgatives and derivatives are further required. The state of the surface may appear to contra-indicate a recourse to blisters; but when the pustules on the trunk, or in the situation where it is desirable to apply a blister, are few, then they may be applied; and in these circumstances, as well as in others in which they should not be resorted to, the terebinthinate embrocations or epithems, often recommended in this work, may be employed without regard to the state of pustulation in the situation, to which it may be desirable to make these applications. The treatment recommended in the complications of continued fevers (*see art.* FEVER, §§ 529. *et seq.*) is generally suitable to those which occur in the course of small-pox; existing pathological states furnishing the only true therapeutical indications in all forms of fever, whether simply continued, or exanthematous, or malignant.

142. Ophthalmia is one of the most common of the concomitant affections in small-pox. In many cases of this complication, the state of the system will not admit of general or copious bloodletting; but in these, as well as in most other severe cases, scarification of the conjunctiva, leeches or cupping-glasses on the temples, warm fomentations,

calomel, purgatives, terebinthinate medicines given by the mouth and in enemata, are required, and should be mainly depended on, in connection with such other internal, constitutional, or febrifuge means as the character and state of the febrile symptoms will suggest.

143. *D. In the confluent states of variola*, or even when the pustulation is profuse and general, the treatment should be such, from the commencement, as will not reduce the powers of life; and even before the eruption appears, and when the character of the primary fever, and the severity of the vomiting and pain in the back and loins, and the stinging heat of the surface, indicate a severe or confluent form of the disease, it may be necessary, especially if the pulse be very rapid, or deficient in tone, or broad, open, and very compressible, to have recourse to the more tonic of the several febrifuge medicines usually employed. In these cases, as well as in others presenting signs of putro-adynamia, as petechiæ, hæmorrhage from mucous canals, a dark brown or black appearance of the eruption, whether at an early stage, or during the maturation and secondary fever, the preparations of *cinchona*, either with the mineral acids or with the alkalies, according to the features of individual cases, are generally required.

144. Cinchona was prescribed in these states of the disease, in various forms of preparation and combination, and was administered in enemata by GESNER, FOUQUET, BAYLEY, HIRZEL, WALL, BALDINGER, and others; and they relied upon it chiefly in the secondary fever, when accompanied with sinking of the powers of life, or with putro-adynamia. HUFELAND advised the preparations of cinchona to be given with antimonial wine; but this combination is admissible only at an early stage of confluent or malignant cases, and is not suited to the more advanced stages, or when hæmorrhagic exudations are observed. In these latter circumstances, I have found the decoction of bark to be most beneficial when conjoined with the hydrochloric acid and the hydrochloric ether, or with the chlorate or the nitrate of potash and tincture of serpentaria, or with the nitric acid and spirit of nitric ether. The sulphuric acid was advised, in the form and states of the disease now being considered, by SYDENHAM, BROCKLESBY, WALDSMIDT, NOWACH, and others, conjoined with various stimulants. More recent writers have conjoined the decoction or infusion of cinchona with the sulphuric acid, and the spirits of sulphuric ether, for these and similar states of the distemper; and still more recent authors have employed the sulphate of quina in these or similar forms of combination. These means are severally of more or less service; and it may be even necessary to combine them still further, as with the tincture of opium, or with the compound tincture of camphor.

145. The nitric acid was recommended by Dr. SCOTT for the more adynamic and confluent states of the malady; the hydrochloric acid by JAHN, and the acetic acid with camphor by MARX, THOMANN, PLINTA, and HOPF. Either of these acids, or of those above mentioned (§§ 143, 144,), or the citric acid, is more or less beneficial when suitably conjoined with tonics, cordials, or stimulants, according to the peculiarities of the case; and in these combinations they have been prescribed by FALCONET, RUSH, THUESSINCK, LAFONTAINE, and others. Of the good effects of the acetic or the citric acid, conjoined with camphor, or with ammonia, this latter being in excess, and given with the infusion or decoction of cinchona, and aided, in the more severe cases, by wine, beef-tea, &c., I can speak from experience.

146. *E.* In the *petechial form* of small-pox, treatment will generally prove inefficacious. Dr. GREGORY thinks that it admits of no essential relief from medicine. He considers purgatives to be inadmissible, and mercury without influence. The loss of a little blood from the arm has appeared to him more effectual than any other measure. "The citrate of ammonia in effervescence, with port wine or brandy, may be given when the powers of life appear to fail, but the hæmorrhagic diathesis is often accompanied by a hot skin and an excited circulation." (*Op. cit.*, p. 104.) When the skin is hot and the circulation excited, in connection with petechiæ, or spots of purpura, or with hæmorrhage from mucous canals, the abstraction of a little blood from the arm may prove beneficial; but these symptoms should not prevent a recourse to the means just recommended (§§ 143. *et seq.*); for they often subside after a decided recourse to these means, especially when the medicines are directed to the prevention or counteraction of the contamination of the blood, and the defect of vital power, upon which they depend. When the prostration is not great, nor the hæmorrhage very considerable, nor the eruption of a dark or malignant hue, then recovery may follow a recourse to cinchona, conjoined with the chlorate or nitrate of potash, and with the carbonate of soda and cordial or stimulant tinctures; camphor, or small doses of turpentine, being given occasionally in the intervals between the exhibition of these. Instead of cinchona, the preparations of valerian may be employed. I have generally preferred them when delirium was present. If the bowels are affected, the preparations of opium, or the compound tincture of camphor, should be added to these; and if the evacuations are very offensive, as well as too frequent, pure charcoal-powder, or the chlorides in small but frequent doses, may be prescribed. When, with these putro-adynamic symptoms, the liver is inactive or congested, then the nitro-hydrochloric acids may be prescribed in the decoction or infusion of cinchona, or the infusion of valerian; and when cerebral symptoms predominate, or when low delirium, tremor, and nervous exhaustion prevail, then the tincture of *sumbul*, lately introduced into practice by Mr. SAVORY, will be found of great service.

147. In cases presenting more or less contamination of the circulation and adynamia, as those now considered usually present, small and repeated doses of *opium*, especially when conjoined with camphor, or the chlorides, or the nitro-hydrochloric acids, or with cinchona, or valerian, or sumbul, will generally be most serviceable. When the bowels are most relaxed, in such cases the preparations of opium are more especially required; and they may be given with milk and lime-water, or with aërated lime-water. In the circumstances just named, and more especially in the secondary fever attended by marked putro-adynamia or malignancy, WANDT and STROEM prescribed opium with the sulphate of alumina. Dr. DRUMMOND recommended the preparations of opium, in large doses, from the com-

mencement of the eruption in confluent cases; **Tralles**, **Gebel** and **Young** adopted a similar treatment. P. **Frank** considered these preparations to be deserving of our chief reliance in these cases; and the same opinion was entertained by **Huxham**, **De Haen**, **Hufeland**, **Sprengel**, **Stoerck**, and others. **Sydenham** considered them of greatest service when exhibited on the fourth day of the eruption in adults, and given in the evening or towards night. He trusted to them especially in the confluent form, and about the eleventh day, or most dangerous period of the disease. **Thomann** prescribed opiates in severe cases, after the exhibition of an emetic; and **Quentin** combined them with the oxide of zinc. The preparations of opium, with the exception of the weak paregoric of the pharmacopœia, cannot be given, without the risk of producing severe cerebral symptoms, in children under the age of four or five years; and even at that age, these symptoms may occur, if they be not guarded against by resorting to cold-sponging over the scalp, and by cooling aperients. In cases which most require opium, camphor, or ammonia, or the usual aromatics or stimulants, are also beneficial, and both promote the good effects, and counteract the injurious influence, of this substance. The excellent effects of the laudanum prescribed by **Sydenham** depended upon the combination of aromatics in its preparation — a combination which has been very imperfectly estimated, even by his warmest admirers.

148. *F.* The *laryngeal* and *tracheal affection*, arising in the course of severe variola, is generally an extension of the specific inflammation existing in the mouth and throat, and is seldom much ameliorated by the means already noticed (§§ 143 — 147.). After having had recourse to these, emetics, especially the sulphate of zinc, or ipecacuanha conjoined with camphor, or ammonia, or capsicum, may be tried; for these have a more decided effect upon the respiratory surfaces than is generally recognised, especially in removing the viscid mucus from the trachea and large bronchi that generally collects in large quantity in these situations when the severe forms of small-pox are thus complicated. In these complications, the decoction of senega, or the preparations of squill, or of ammoniacum, conjoined with camphor, or ammonia, or other substances which the circumstances of the case will suggest, may be prescribed; and if these expectorants should act as emetics, as they will generally act when given in large doses, the effect will be the more beneficial, especially in confluent, or severe, or malignant cases.

149. *G.* The occurrence of *diarrhœa* or of *dysenteric symptoms*, especially in connection with the secondary fever and in confluent cases, requires means which should partly depend upon the appearance of the evacuations. In most cases, the medicines already mentioned (§§ 146. *et seq.*), ipecacuanha with camphor and opium, or with powdered carbon and the compound chalk-powder; and the other medicines usually given for diarrhœa or dysentery, may be severally prescribed in these complications of small-pox. **Sydenham** gave boiled milk with lime-water in these cases, or with ammonia or magnesia when the stools evinced a somewhat sourish odour; and **Royer** and many others adopted a similar practice. But when this complication appears in malignant, or even in the more usual confluent cases, more active astringents are required, and these should be associated with antiseptics, and absorbents, and opiates.

150. *H.* The state of the *urinary secretion* should receive due attention from an early period of the disease. The urine is often not only small in quantity, but also voided at long intervals in some instances; and it is occasionally remarkably high-coloured, and even contains albumen, and not infrequently blood, especially in the confluent and malignant cases. In the early stages of the more phlogistic cases, especially when the urine is scanty and very high-coloured, demulcents and diluents should be freely given, with the cooling diaphoretics already mentioned (§ 131.), and with diuretics of a cooling and febrifuge kind, as recommended by **Thomann**, **Lentin**, and others. When the urine contains albumen, or blood, globules, or even pure blood, then the terebinthinate embrocation or epithem may be applied over the loins, and repeated according to its effects.

151. *I. Small-pox in puerperal females*, especially when it occurs very soon after delivery, is always a most dangerous disease. Not only is it generally confluent, and attended by marked asthenia, but it is also complicated with very severe, and usually fatal, affection of the respiratory mucous surface, extending to both lungs. Of several cases of variola to which I have been called in the puerperal state, I have seen only one which was mild and uncomplicated. The treatment in these unfavourable circumstances should partly depend upon the time which has elapsed between delivery and the appearance of the distemper, partly upon the amount of hæmorrhage which has taken place at the period of delivery or subsequently, and upon the states of the lochia and of the lacteal secretion. When the discharges have been and are free, and the pulse is very frequent and soft, the severity of the laryngeal, bronchial, or pulmonary complication, or indeed of any other associated affection, should not prevent recourse to the means already recommended for the severe, confluent, and adynamic states of the malady (§§ 143. *et seq.*), especially to camphor, ammonia, wine, or other stimulants and tonics; or to such as are advised for the malignant form of *puerperal fever* (see that article). When the respiratory passages are very severely implicated, the remedies already mentioned, especially senega, squills, ammoniacum, sulphate of zinc, &c., prescribed as expectorants or as emetics, according to the emergency of the case, ought not then to be overlooked. The great severity and unfavourable prognosis of small-pox in the puerperal state should not prevent a decided recourse to the most active means in the treatment of this class of cases, but, on the contrary, should induce us to employ the most energetic medicines in the most prompt and appropriate manner.

152. ii. EXTERNAL MEANS HAVE BEEN USED TO GIVE RELIEF AND PREVENT PITTING, but they do not always succeed as respects the former intention, and they often fail as regards the latter. When pustulation is profuse, Dr. **Gregory** advises the surface to be liberally covered with some simple dry powder. Starch-powder, hair-powder, and powdered calamine are alike available for this purpose; cold cream, and mild unguents,

such as the unguent. cetacei, with a proportion of oxide of bismuth, are useful when there is much cutaneous irritation with a dry surface. "Fomentations and poultices are the only means of treating those abscesses and erythematous inflammations which so harass the patient, and so fearfully peril life in the later periods of secondary fever. All the attempts made by the use of masks to prevent pitting end in disappointment. The only effectual means of lessening such disfigurement are those which allay cutaneous action. Purgative medicines, low diet, and free exposure of the face to a cool air, are the sole measures on which reliance should be placed." (*Op. cit.*, p. 108.)

153. Whilst these means ought to be adopted, others may also be tried. Fresh air should be duly admitted; but, at the same time, light ought to be excluded as completely as possible. I believe, from what I have observed in several cases, that complete darkness prevents pitting, and that light increases the suppurative action in the pustules, and thereby occasions deep and permanent marks. Whilst the patient should breathe a freely-renewed air, the vesicles should be protected from the action which the oxygen of the air exerts upon them; and this may be done by various means, either by causing the vesicles to discharge their contents before suppuration commences, and by favouring the drying of their contents upon their surfaces, the scabs thus forming a natural protection from the action of the air; or by covering the vesicles with some substance, which may lessen the suppurative process, by protecting them from the air, and by lowering inflammatory action in the cutaneous surface.

154. The Arabians opened the pustules as fast as they ripened by a gold needle; and the moderns have applied lunar caustic to the pustules, so as to destroy them at an early period of their development. As to this latter practice, Dr. GREGORY remarks that, as a partial application — say to vesicles forming near the eye — he can recommend this measure; but that he cannot advise it to be employed to any large surface covered with confluent or semi-confluent vesicles. He adds, "The latest mode of treating the surface during the maturative stage of small-pox, is that of applying mercurial plasters, containing calomel, or corrosive muriate of mercury, or covering the whole surface with mercurial ointment. In the French hospitals at the present time, the latter mode is in fashion. The reports of its success are not, however, very flattering. I have seen all three plans fairly tried at the Small-pox Hospital. The ointment and calomel plasters were inefficient. The plaster of corrosive sublimate converted a mass of confluent vesicles into one painful and extensive blister; but I am still to learn what benefit the patient derived from the change." (*Op. cit.*, p. 103.)

155. Other means have been used for the prevention of pitting, either by causing the abortion of the pustules in the course of their development, or by drying them up after they have maturated. Dr. BULKLEY remarks, that, as a general rule, the more recent the eruption, the more easily it is arrested. One writer thinks that the pustules can be arrested, even after their suppuration, and another fixes the period at which this can be done as late as the seventh day. In 1825, I tried the effect of complete exclusion of light in preventing pitting, and in that case it was altogether successful. I have since had recourse to it in three or four cases with success; in one confluent case it failed. I have, in three other cases, covered the surface of the face with almond or olive oil, and excluded light, keeping the apartment freely ventilated; these have not been marked; the eruption was very copious, but not confluent in any of these. Instead of almond or olive oil, glycerine, or collodion, as suggested by Dr. RANKING, may be employed.

156. Incising or opening the pustules, or rather the vesicles, as recommended by the Arabians, was the method of causing their abortion advised by ROGGERT, VOIGT, TOURNAY, and HUFELAND. M. VELPEAU and Dr. MORTON assert, that if the pustules are cauterised within two or three days, or even later, no marks will be left. The latter says that, if the face be frequently wetted with spirits of hartshorn, the inflammation will be abated, and the pustules will be prevented from becoming either large or irritable. M. PIORRY recommends blisters to cause abortion of the pustules, but I consider their use not required in discrete cases, and of very equivocal benefit in the more severe states of the distemper. M. MALAPERT prescribes a solution of hydrate of potassa, which, he says, dries up the pustules, without leaving either cicatrices or stains. The strength of the solution is not stated.

157. Many years ago, DIGBY directed the face to be covered with *gold-leaf*. LARREY advised the same means, and stated that this method of preventing pitting by small-pox was employed from time immemorial by the Egyptians and Arabians. It can act only by excluding light and air from the diseased surface. Drs. CRAWFORD and S. JACKSON, of the United States, say that they have found the *tincture of iodine* to succeed in preventing the marks of variolous pustules; and various kinds of ointment and plaster have been also confidently recommended with this intention.

158. *Sulphuric ointment*, rubbed lightly, three times a day, over the parts affected, has been recommended for the prevention of suppuration in the pustules and the consequent pitting (*Gaz. Méd. de Paris*, Avril, 1841, p. 232.). The emplastrum plumbi, melted with oil of almonds, and laid over the face by a camel's-hair pencil, has been prescribed by Dr. CORRIGAN (*Dublin Quarterly Journ. of Med. Science*, Aug. 1846, p. 245.). A mask, composed of mercurial *ointment*, rendered more consistent by means of starch or fecula, is employed by M. BRIQUET. He causes it to be spread over the face, and to be renewed once or twice daily. He says that it produces abortion of the pustules, and prevents the swelling attending the confluent form of variola. The same means have been recommended by Prof. BENNETT, of Edinburgh (*Edin. Monthly Journal of Med. Science*, Jan. 1850.).

159. A compound mercurial *plaster*, called the "plaster of Vigo," is often employed for the prevention of pitting by French physicians. According to M. BRIQUET, if mercurial plaster be applied before the fifth day of the eruption, one of two things happens — either the pustules disappear by resolution, or they are changed into vesicles or into tubercles. The latter change is more rare, and seldom takes place except on the face. When

the dressing is removed, small, hard excrescences, insensible to the touch, are seen, which gradually fade, and disappear at the end of ten or twelve days, partly by resolution and partly by desquamation, and without leaving any trace. The mercurial plaster must be kept on from eight to twelve days. (*Gaz. Méd. de Paris*, Avr. 1846.)

160. A solution of corrosive sublimate — one grain to seven ounces of distilled water, and a drachm of laudanum—applied by compresses kept wet with it, is also said by Dr. BULKLEY to produce very marked effects in causing the disappearance of pustules, even after they have fully matured; and he adds that simple mercurial ointment is much more frequently used, both in Europe and in America, than either the plasters of Vigo or the wash of the bichloride, and is probably equally efficacious. It may be applied freely with a brush, or a camel's-hair pencil. Dr. STEWARDSON, of Philadelphia, speaks very favourably of its effects (*Amer. Journ. of Med. Science*, June, 1843. *See also* Dr. BULKLEY's *Notes to* Dr. GREGORY's *Lect. on Erupt. Fevers.* New York. Ed. 1851, p. 351.).

161. iii. INOCULATED SMALL-POX should be treated according to the principles already insisted on, and with strict reference to the type or character of the primary fever, and other features of individual cases. The SUTTONS and DIMSDALE, whose reputation for successful inoculation became so remarkable about the middle of the last century, and somewhat later, insisted upon exposure of the surface of the body to cold air during the primary fever, and upon the full adoption of the antiphlogistic regimen.

162. It was recommended by many physicians who practised inoculation before the introduction of vaccination, to *prepare* the patient by treatment shortly before and after the operation, or until the primary fever appeared. Others considered any preparation unnecessary, and sometimes even prejudicial. Several eminent writers, such as THOMANN, HUFELAND, and others, advocated the propriety of correcting the secretions and excretions, and of promoting a free state of the several emunctories, especially when these appeared to require this aid, by one or more doses of calomel and antimony. FORDYCE, however, considered this practice to be unnecessary, and EYEREL, BOEHMER, and others contended that there is no mode of preparation of any use. GMELIN recommended abstinence from animal food for some time previously to inoculation, but WEIKARD believed even this plan to be injurious. On this topic, Dr. GREGORY very judiciously remarks, "Perfect health being the best condition for receiving and safely eliminating the poison, every thing that tends to diminish plethora, to lessen cutaneous action, to render the bowels free, to preserve the blood in a cool, pure, and normal condition, was found useful. Laxative medicines, a moderate diet, abstinence from all fermented and spirituous liquors, cool chambers, gentle exercise in the open air, light clothing, all contributed, in their several degrees, to the successful result. The antimonial and mercurial medicines, which the SUTTONS laid much stress upon, were useful only to secure the co-operation of the patient in matters of more necessity, especially diet and exposure to the open air." (*Op. cit.*, p. 110.)

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SOFTENING OF STRUCTURE.

— SYNON: *Softness of organs*; — *Mollities*; — Μαλακότης (from *μαλακός*, mollis);—*Structuræ mollities*; — *μαχακοσαρκος*, Galen; — *Ramollissement*, Fr.;— *Erweichung, malacia*, Germ.

CLASSIF.:— GENERAL PATHOLOGY—MORBID STRUCTURE — THERAPEUTICS.

1. *An individual structure, or part, or organ, may present more or less softness, or diminution of its healthy or normal density, or of its natural state of vital cohesion*; — it may be preternaturally soft, still retaining its usual amount of cohesion; it may be unusually friable, without being softened, or without losing its density; but these states are comparatively rare, for when the one property is impaired the other is also diminished, and *with softening cohesion is generally proportionately lessened*. Softness of structure is commonly not merely physical, but also vital. The structure evinces an impaired cohesion of its molecules, and a diminished vital resistance to external agents. When treating of the changes evinced by individual structures, I have always described, as one of these changes, diminution of their cohesion, or softening. Thus softening of the brain, *Mollities cerebri*, is considered in the article BRAIN; softening of the heart, *Cardiomalacia*, in that on the HEART; softening of the stomach, *Gastromalacia*, in that on the STOMACH, &c.

2. I. PATHOLOGY OF SOFTENING OF STRUCTURE. — *Preternatural softness of structure* is sometimes recognised during life; but most frequently comes under the observation of the physician after the dissolution of his patient; and it then becomes sometimes a question how far it may be a post-mortem change. There can be no doubt of much of the softness often found in the brain or spinal cord after death is post-mortem, although the change may have commenced some time before death; and this remark equally applies to softening of the tissues of the *digestive canal*. (See this art., §§ 34. *et seq.*)

3. *Softening of structure may occur after death*. — 1st. From the action of the gastric juice on parts with which this fluid is brought in contact soon after, or at the time of dissolution. — 2d. From infiltration or maceration of effused fluids, and putrefaction.

4. Softening may take place *during life*. — 1st. From congestion, and, still more manifestly, from effusion or infiltration of blood in the structure. — 2d. From inflammatory action. — 3d. From disease of the arteries or veins connected with the softened part. — 4th. From impaired organic nervous power of the part, causing impaired nutrition, sometimes with serous infiltration, or with fatty degeneration, or with a certain amount of either of these. Softening of structure after death has been noticed when treating of changes observed in the digestive canal and in other organs; but I shall here offer a few remarks on the pathological conditions of which it is a consequence during life.

5. i. The several changes just enumerated as most frequently producing softening of structure are chiefly concerned in causing this effect in particular organs or parts. But there are other states which occasion a *more or less general softening or loss of vital cohesion in most of the structures of the body*; and this softening may exist in a very remarkable degree throughout the whole frame, excepting the bones. It is presented to us during life chiefly in pestilential diseases and malignant fevers, and occasionally as a result of virulent poisons. The softening of the structures in these distempers is a consequence, as I have shown when treating of these distempers, 1st., of impaired and vitiated organic nervous influence; — 2d., of a contaminated state of the blood, with an impaired crasis of its fibrine, and change of the blood-globules; these two prime factors of ulterior alteration acting and reacting on each other. The softening of structure in the more severe cases of the several pestilences, and in the more malignant of exanthematous and continued fevers, had been in great measure overlooked until I described it in early parts of this work and in other places; and to what I have advanced respecting these diseases, under their several heads, I must refer the reader for my description of this remarkable change — this general diminution of vital cohesion of the tissues — at an advanced stage of the malady, or towards the close of life, with the rapid accession of putrefaction after death. This general and rapid form of softening may be called *acute general softening of the tissues*, to distinguish it from *partial or limited softening*, on the one hand, and from *chronic general softening* on the other.

6. ii. When softening of structure is *partial as to its seat*, or *limited to a single structure or organ*, it is a consequence of one or more of the pathological states enumerated above (§ 4.). — *A*. It may be the result, or the concomitant, of *congestion of blood* in the capillaries of the part, or of an *exudation of blood* from these vessels, and of the infiltration of it in the substance of the part. When the vital or the organic nervous influence of the part, and of its vessels, is impaired, the blood is liable to congestion in the vessels, or to further change; and, as a consequence, or as a concomitant of this state, softening of the part is liable to supervene. If, as a result of this change in the capillaries and their contents, blood be effused into the structure of the part, softening still more certainly ensues, and with a rapidity proportionate to the failure of vital power and resistance in the surrounding parts. The softening which is observed in congested and enlarged spleen, whether occurring primarily, or as a consequence of periodic fevers, and some of the cases of softening of the lungs are illustrations of the consequences, or of

the concomitant effects, of congestion of a simple or asthenic kind; whilst the red softenings seen in portions of the brain, and the softening with ecchymoses and bloody infiltrations, observed in several viscera and structures in scurvy, purpura, asthenic hæmorrhages, and in malignant or putro-adynamic fevers, &c., show the great extent to which softening proceeds when it is accompanied with exudations of blood. In all cases, when blood is exuded, infiltrated through the structure, or accumulated in masses, and retained even for a short time, softening of an inflammatory kind, although asthenic as to tone, certainly supervenes, and extends, more or less, according to the grade of vital resistance.

7. *B. Inflammatory action* is generally attended by softening of the affected parts; and when softening has not become apparent, or even when the part seems more dense, owing to the infiltration of a concrescible lymph, there is a defect of vital cohesion, as evinced by increased friability. The sthenic and chronic states of inflammation evince less softening and friability than the more asthenic and acute states. Erysipelas and other spreading inflammations, and still more the diffusive inflammation of cellular and adipose tissues, are often attended by softening, amounting to diffluence and disorganisation; and in proof of these changes, I have only to refer to these maladies, and to the art. GANGRENE.

8. *C. Disease of the arteries and veins*, especially of the former class of bloodvessels, is a very common cause of limited softening of organs. Obliteration of an artery, or even specific deposits in the coats, or other changes affecting the calibre, or impairing the healthy action of the vessel, as atheromatous or fatty deposits, may impair the nutrition of the part supplied by the diseased vessel, and thereby occasion softening and impaired vital cohesion of it. Instances of this connection or sequence, or even sometimes concomitance, of alteration, are often presented in the brain, heart, and other parts. Softening in these cases, more especially in the heart, is sometimes associated with a fatty degeneration of the structure of the organ. (See the chapter, in the article HEART, *on fatty degeneration of its structure*, §§ 224. *et seq.*) I have stated, when treating of *apoplexy*, that the change in the vessels of the brain, and in those of the heart, are sometimes the same at advanced age; and that whether the change be specific deposits in, or atheromatous or fatty degeneration of, the coats of the vessels, they frequently exist in the vessels of both these organs, and account for the not infrequent complication of disease of the heart with either apoplexy or palsy.

9. When the change in the arteries consists of atheromatous deposits in their coats, — which deposits were described by me in 1830, when writing on the diseases of arteries, and were stated to "consist of a suety matter, greasy to the touch," &c. (*see art.* ARTERIES, § 59.), — then the structures supplied by arteries thus affected are often not merely softened, but also otherwise changed; the softened part being flabby, and as if infiltrated with serum, and with more or less oil-globules. In other cases, especially when this change in the arteries is connected with softening of the cerebral structure, serous effusion often accompanies it, especially into the adjoining ventricles, and occasionally as an infiltration of the softened structure; this effusion being probably the result of the physical condition of the organ, and either of the state of circulation in the part, or in its vicinity, or of the atrophy sometimes attending softening. Whether or no softening of the cerebral structure is attended by more or less of fatty degeneration, as observed in the heart, has not been ascertained; but it is not improbable that the fatty elements, contributing in their various degrees, to produce what has been recently, and not always correctly, described as fat (and of which the earliest notices are contained in various articles of this work, especially ARTERIES, § 59.; DISEASE, §§ 135. *et seq.*; HEART, STRUCTURAL CHANGES OF, §§ 224. *et seq.*; PLEURA, § 100.; SEROUS MEMBRANES), are more or less augmented above the natural standard in the softened structure of the brain; the healthy structure of the organ containing from three to eight per cent. of fat, which exists chiefly in the medullary structure.

10. Disease of, or obstructed circulation through the *veins*, produces softening of the tissues, the blood of which passes to the affected veins; but the softening generally presents peculiar characters. It is always attended by great congestion, or infiltration of serum, or ecchymoses, or by all three. The vital tone or cohesion of tissues thus circumstanced is already partially lost; and when they are subjected to any irritation, inflammatory action of an asthenic character, is soon produced, which rapidly spreads, still further softens the part, and ultimately destroys its cohesion and organisation.

11. *D. The organic nervous influence* of a part is more or less impaired, either previous to, or in connection with, the changes already noticed as productive of softening. But this influence may be impaired primarily, and chiefly, and independently of any of the changes now adduced. It is thus impaired either congenitally or hereditarily, or by the injurious agents in operation during early life; and the consequences are a preternatural softness and flabbiness, and impaired vital cohesion, of all the structures, not excepting even the bones, which, as shown in rickets and scrofula, are not only slowly and imperfectly developed, but more or less softened, especially in their spongy parts. This *chronic form of general softening* may exist in the fœtus, without being hereditary; it may be hereditary, and yet not appear until some indefinite period after birth, as when it proceeds from scrofulous parents. It may be acquired from the nature or the supply of nourishment, or from the want of pure air, &c.; the scrofulous, or ricketty, or tubercular habit of body, being thereby produced in young subjects, and the scorbutic at more advanced ages. *Scurvy* furnishes one of the most remarkable illustrations of chronic general softening, or general impairment of vital cohesion, advancing in a slow and progressive manner, commonly in adults, *rickets* equally illustrating it in children. The general cachexia resulting from the *syphilitic poison*, or from *mercury* acting in poisonous doses or modes, or from the use of the *ergot of rye*, or from other poisonous substances, is chiefly characterised by softening, implicating, more or less, the whole of the structures, although manifested especially in certain tissues, particularly the cutaneous and cellular, the osseous and periosteal, the mucous,

&c., and, in certain of these, passing extensively into *ulceration*, of which softening is a general antecedent.

12. *E. Softening often depends upon the association, in various degrees, of the foregoing morbid states*, especially those causing partial or limited softening, and, even when thus associated, in its slighter grades it may be transitory, as when it occurs from œdema, or saturation of the tissues of a part with serum. Such saturation may proceed from local weakness of the tissue, or of the capillaries supplying it, or from more general debility, or from local changes, as obstruction in the returning circulation of the part, or obstruction of the absorbents, causing this lesion. The serous infiltration may be soon removed, or it may persist, or it may increase, and the attendant or consequent softening may also increase, and even go on to disorganisation; certain intermediate changes, however, sometimes appearing, especially asthenic inflammation. In these cases, the infiltration of serum, by its macerating property, weakens the vital cohesion of the tissue, or, by the possession of an irritating quality, induces a diffusive or asthenic inflammatory action, frequently passing into gangrene. The mere separation of the intimate structure of cellular or adipose parts, by the infiltration into it of an inorganised and inorganisable fluid, if continued long, tends to loosen the vital cohesion of the part; and when this fluid contains, as often occurs, excrementitious or injurious materials, the result is both increased and hastened, especially as it often also associates with it other changes, seated in the vessels supplying the part, tending most rapidly to gangrenous softening.

13. Œdema, or serous infiltration of the substance of the brain, whether the antecedent or the concomitant of softening of the cerebral structure (for it may be either the one or the other), generally induces and accelerates the softening process in this structure more remarkably than in any other organ; complete disorganisation, or decomposition, being thereby often rapidly induced.* Few parts, either by their physical condition, or by the nature of their organisation, are more frequently subject to serous saturation than the brain; and although the serous exudation is most frequently excessive between the membranes and in the ventricles; more or less fluid being always in these situations, — still the excessive accumulation of it in the ventricles will often affect the vital cohesion of the surrounding structure, so as to predispose to, or occasion softening in this situation or in the vicinity, especially in the scrofulous diathesis and in ricketty habits, in which the vital cohesion of the tissues is generally weak.

14. Congestions of blood in parts, asthenic and erysipelatous inflammations, the accumulation of excrementitial and irritating materials in the circulation, and the operation of animal and contaminating poisons, all in their several grades occasion more or less softening, which is most remarkably manifested in those tissues, the organisation of which is most loose or yielding, as cellular or mucous structures and parenchymatous organs. In these, especially, the softening is followed by the exudation of a fluid, which is neither pus nor concrescible lymph, even when the softening is most inflammatory, but which, in the scrofulous diathesis, is either tubercular, or curdy, or sanious, or an association of these; and in persons who are constitutionally exhausted, or whose blood is self-contaminated or otherwise poisoned, the morbid fluid, serous or sanious, infiltrates the adjoining tissues, softens them with various degrees of rapidity, and ultimately disorganises or decomposes them. These consecutive states of softening, whether manifested in external or internal parts, in cellular and adipose tissues, or in mucous or parenchymatous organs, are presented to our observation in the course of adynamic or malignant fevers, and after the absorption of puriform and sanious matters into the circulation, and in the several forms of erysipelas; and whether puriform matter be formed in the softened part, or a sanious fluid, or a foul, contaminating serum, infiltrating adjoining parts, they always tend to further disorganisation, or decomposition or gangrene supervenes, unless vital power and resistance be reinforced, and the contaminating state of the circulation be counteracted or remedied by suitable treatment.

15. II. THE THERAPEUTICAL INDICATIONS applicable to softening of structures, should be based upon the pathological states from which it appears to proceed, or with which it is associated. But the result of treatment will entirely depend on the acumen of the physician in detecting this condition of structure and the changes in which it originates, and in attributing to each its due influence, and in adapting his means of cure to their several grades and relations. When treating, under their proper heads, of the several states of softening, as manifested in different structures, I then pointed out the measures most appropriate for each; and, reviewing this lesion as one of the most advanced, and as one of the most dangerous. I then more especially considered the treatment most conducive to the removal of the changes from which it proceeds. Whether arising from inflammations, especially the asthenic,—or from congestions, hypostatic or others, — or from obstruction of vessels, arterial, venous, or lymphatic, — or from morbid matters conveyed into the circulation, and thereby affecting predisposed or previously disordered parts, — or from the diminution of certain elements necessary to vital density or cohesion, as phosphorus, or sulphur and their combinations, — or from morbid poisons changing the states of organic nervous power, and of the circulating fluids, more or less, generally, — or lastly from the nature of the food and from states of nutrition, — the treatment of softening of structure has received due consideration, as respects, not only this particular lesion, but also the changes from which it proceeds. In the several articles on ABSCESS (§§ 62.); ABSORPTION (§§ 15. *et seq.*); ARTERIES (§§ 40. *et seq.*); ARTS AND EMPLOYMENTS (§§ 23. *et seq.*); BRAIN, *softening of the* (§§ 214. *et seq.*); CACHEXY (§§ 4. *et seq.*); CELLULAR TISSUE (§§ 9. *et seq.*); CHOLERIC FEVER OF INFANTS (§§ 11 *et seq.*); CONGESTION OF BLOOD (§§ 12, 13.); DEBILITY (§§ 25. *et seq.*); DIGESTIVE CANAL, *softening of* (§§ 34. *et*

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* It is not improbable, that softening of the nervous centres is favoured, if not caused, by a deficiency of sulphur or of phosphorus, or of both, and of their combinations, in the cerebral structure, these substances being always present, but in varying quantity in this structure, in its normal states.

seq.); Dysentery, Asthenic (§§ 88. *et seq.*); Erysipelas (§§ 64. *et seq.*); Fever (§§ 559. *et seq.*); Gangrene (§§ 57. *et seq.*); Hæmorrhage (§§ 40. *et seq.*); Heart, *softening of* (§§ 216. *et seq.*); Inflammation, Asthenic (§§ 236. *et seq.*); Intestines, *softening of*, (§§ 131. *et seq.*); Œdema, Pestilences, especially the Hæmogastric and Plague (*in numerous places*); and Scrofula.

16. In the treatment of softening of individual structures, as well as of the general softening of the tissues consequent upon malignant fevers, and morbid states of the circulating fluids, attention should be chiefly directed to those pathological states of which softening is the consequence; and these ought to be either removed or counteracted by means suited to these states, the most important of which have been indicated above (§§ 6. *et seq.*), or more fully mentioned in the articles just referred to. But it should always be remembered, that the removal of the causes; a supply of deficient elements, in medicines, aliments, and mineral waters; a suitable diet and regimen; a pure, dry, and bracing atmosphere, with free ventilation; a healthy discharge of the digestive functions, and the use of pure, or appropriate mineral springs, are the chief means of cure.

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SPASM: — Synon. — *Spasmus.* σπασμος (from σπαω); *Hyperkinesia* (from ὑπὲρ, and χίνησις). I. Frank; — *Mobilitas nervosa nimia*, Auct. var. — *Ataxia Spirituum:* — *Spasmes*, Fr.— *Krampfe*, Germ. — *Cramp.*

Classificat. — II. Class. — II. Order (*See Preface*).

Definit. — *Involuntary or abnormal actions of muscular parts: or, in other words, contractions of muscular structures, different in continuance, or in severity, or in recurrence from healthy action; constituting a generic pathological condition; and although most commonly a sympathetic, yet an important morbid state.*

1. I. Varieties of Spasm.—The ancients comprised under the term, spasm, all convulsive affections or movements, but the sense in which the word is now and more strictly applied, is the contraction or tension of a muscular structure, independently of volition, and often disposing to or followed by convulsion. Spasm, or cramp, frequently exists without convulsion, it may affect either voluntary or involuntary muscles; and, in either of these situations presents varying characters; and it may be attended by consciousness, or by an abolition of sensation, or even by various derangements of sensibility and mental manifestation. The supporters and followers of the nervous system of pathology, especially Stahl, Hoffmann, Juncker, Sauvages, Cullen, and others, attached great importance to this morbid condition, and sometimes inferred its existence, especially in internal and involuntary structures, where there was no evidence of its presence. Although the partial revival of the humoral pathology, to which the early articles of this work have in no small measure contributed, especially those on the Blood, on Disease, on Absorption, Excretion, Infection, &c., has, in some degree, diminished the importance which had been attached to spasm, as an influential pathological state, still it performs a part of considerable interest in the general doctrine of disease.

2. Sauvages arranged under spasm, all involuntary muscular contractions, and divided them into *tonic* and *clonic*. Under the former appellation he comprised those contractions which were, more or less, permanent or continued; under the latter he ranged those which alternated with relaxation; and both forms of spasm he divided into *partial* and *general*. *Partial tonic spasm*, according to him, embraced strabismus, trismus, torticolis, priapism, and cramp attacking any of the voluntary muscles. *General tonic spasm* consisted only of tetanus and catalepsy. *Partial chronic spasms* were carphologia, pandiculation, tremor, palpitation, &c.; and *General clonic spasms* were, eclampsia, epilepsia, hysteria, chorea, &c. Cullen adopted the view of Sauvages, in constituting spasmodic affections a distinct order of nervous diseases. Pinel, however, did not consider that the spasmodic state should be made the basis on which an order of disease might be founded.

3. It is very doubtful, whether or no, catalepsy should be viewed as a species of general tonic spasm, or even as a spasmodic affection at all. I have seen several cases of true catalepsy, and in these there was no increased action of muscles apparent. In cataleptic ecstacy, however, many of the voluntary muscles are, more or less, contracted; and when catalepsy occurs in connection with hysterical attacks, muscular contractions often precede the cataleptic state. In most of the convulsive affections arranged under eclampsia, epilepsy, and hysteria, the seizure is generally tonic at its commencement, and clonic towards its termination; so that it is very difficult to distinguish between those convulsive or spasmodic affections which are tonic, or which are clonic, these terms being altogether conventional, and the morbid states which they are intended to represent, passing gradually and insensibly from the one into the other.

4. MM. Pinel & Bricheteau divided spasmodic affections into those which are unattended, and which are attended by lesion of the faculties of intelligence. Dr. Mason Good arranged these latter, under the genus, "*Comatose Spasm*," assigning convulsions, hysterics, and epilepsy, to it, as species. But hysterical spasm is often unattended

by any comatose affection, or loss of sensibility; and here, as well as in other morbid conditions, the difficulty of classification becomes apparent. Dr. GOOD divided his order of spasmodic affections, or nervous disorders affecting the muscles, into three genera, consisting of "Constrictive spasm," of "Clonic spasm," and of "Synclonic spasm." The *first* of these comprised priapism, wry neck, distortion of the spine, muscular stiff-joint, cramp, locked-jaw, tetanus, rabies, and suppressed pulse; the *second*, hiccough, sneezing, palpitation, nictitation, subsultus, pandriculation; the *third*, tremor, chorea, shaking palsy, raphania and barbiers.

5. Dr. GOOD defined his genus "*Entasia*," or constrictive spasm, to be "irregular muscular action producing contraction, rigidity, or both." The genus *clonus*, or clonic spasm, he described as "forcible agitation of one or more muscles in sudden and irregular snatches," or, in other words, agitative or tremulous motions of the muscles. The genus *synclonus*, or synclonic spasm, he stated to be "tremulous, simultaneous, and chronic agitation of various muscles, especially when excited by the will," or a "multiplied conjunctive or compound agitation, or tremulous motion." The reader, upon consideration of the above definitions, will be at a loss to perceive the generic differences between the genera, clonus and synclonus, and he may not be satisfied that tremor and shaking palsy should be ranked as species of spasm.

6. Spasmodic action may occur in either voluntary or involuntary muscular structures. In the former it may be limited to one or more muscles, or extended to several, or even more or less generally; it may also, when so situated, be either simple, or associated with unconsciousness. In the latter class of structures, it is always partial or limited, and is generally complicated with irritation, or congestion, or inflammatory action, in adjoining or related parts. Spasm, moreover, is most frequently and strictly a *symptomatic* affection, and is rarely a *primary* or *idiopathic* disorder, unless when it occurs in the form of cramp, or from over-exertion of the muscles affected, or from bringing muscles that have been long disused into action.

7. Spasm may be arranged into, 1st., that affecting involuntary muscular structures, or those parts which are supplied only or chiefly by ganglial nerves; 2d., that attacking muscles which are influenced by voluntary nerves; 3d., spasm implicating both involuntary and voluntary structures; and 4th, spasm associated with want of consciousness. When spasm is seated in either involuntary or voluntary parts, it may be of varying duration; it may be continued for a time and then permanently relaxed; it may be thus continued and afterwards recurrent or convulsive; or it may be recurrent or agitative from the commencement, thus presenting either of, or all, the forms classed by Dr. GOOD as tonic, clonic, and synclonic, and being either partial, or limited, or more or less general. The limited states of spasm may be of considerable duration, and may even pass into a state of permanent contraction, although this may be a rare occurrence. Several of the unnatural positions of organs or parts, as those of the eye, extremities, &c., have been attributed to spasm of particular muscles; and probably the mal-position may have originated in this state, the contraction becoming permanent, whilst the spasm no longer existed; but it may have equally originated in a paralysed condition of antagonist muscles. In these cases care should be taken to distinguish between tonic spasm, permanent contraction of muscles or parts, and the deficiency of antagonist action.

8. i. *Spasm of involuntary structures* is an element of several diseases. It is most common in the digestive canal, in various parts of which it may exist in succession, generally in a recurrent, although sometimes in a more continued form. It may be limited to this canal, or be extended to adjoining parts, or even to voluntary organs. It may, when affecting the alimentary canal, be merely an exaltation of the peristaltic motion, as in diarrhœa or dysentery; or it may be more severe and attended by inverted action, as in vomiting, spasms of the pharynx or of the œsophagus. In these cases the spasmodic state is favoured either by extreme debility and sensibility of the seat of the disorder, or by inflammatory irritation, and is directly occasioned by any irritating substance. In any circumstance, the spasmodic action will be produced by irritations sufficiently great to excite it; and when the vital power of the parts is low, and the susceptibility great, even the accumulation of the natural secretions within these parts, or a vitiated state of the secretions, is sufficient to cause spasm, as evinced by certain states of diarrhœa, by vomitings, by colic, bilious cholera, &c. When any irritating body is brought in contact with the mucous surface of the digestive canal, whether that be gaseous, fluid, or consistent, spasm will generally affect the parts thereby irritated, or their more immediate vicinity. The same effect follows inflammatory action and ulceration, which are often followed by spasmodic action, as demonstrated in various parts of this canal, in the pharynx, the œsophagus, the stomach, the duodenum, the small and large intestines. Similar causes produce similar effects in the urinary passages, and even in the respiratory passages. In these latter the spasmodic action is often the most remarkable, and is generally followed by very manifest effects.

9. Various involuntary canals or parts have been supposed to be seats of spasm in certain disorders without sufficient reason. Thus the gall-ducts have been accused of spasm in some states of jaundice, and the capillary vessels in the cold stage of fevers. That irritating or morbid bile, or irritants at the mouth of the ducts in the duodenum, may cause spasm of these ducts, is very probable, but there is no palpable demonstration of this effect. That there is an apparent constriction of the capillaries, especially of those on the surface of the body, is very manifest in the cold stage of fevers and in states of vital depression; but it does not follow that the constriction is the consequence of spasm. It is merely the result of the contraction of these vessels upon a deficient amount, or the entire absence, of their contents, which are no longer propelled with sufficient power to fill or distend them, during these states of the frame.

10. Spasm of the parietes of the cardiac cavities has also been inferred to be present in cases of nervous palpitation; and when death has taken place suddenly, without any manifest organic lesion. That nervous palpitation is truly spasmodic, even when most exalted, is extremely doubt-

ful. There is certainly remarkably increased action and impulse with all the symptoms described when treating this affection of the heart (*see art.* HEART, §§ 43. *et seq.*); but morbidly increased action is not quite identical with spasm, although often nearly approaching it. With increase of action, prolongation or irregularity of the contraction is generally present in the spasmodic state. If we admit the occurrence of spasmodic or spastic contraction of the parietes of the heart of a much longer duration than that which takes place normally, death must necessarily follow; but I much doubt the existence of this lesion, especially in such grade or continuance as to occasion death. It certainly has not been satisfactorily demonstrated, although admitted by some writers.

11. ii. *Spasm of voluntary muscles or parts* is of frequent occurrence, either in the form of cramps of particular muscles, or in that of convulsive action of several or many. Cramps in the extremities may follow over-action of the muscles attacked, or be symptomatic of disorder of the digestive canal, or of latent or inflammatory changes in the brain or spinal chord, or their membranes, or of the irritation produced by the circulation of effete or injurious materials in the blood, as in cholera, gout, &c. They may even follow a certain amount of pressure upon, or irritation of the nerves, supplying voluntary parts, either at the origins, or in the course of these nerves, with or without any other manifest disorder. Cramps or spasm, of the lower extremities especially, often precedes, recurring at intervals, for some time an attack of paralysis or apoplexy, particularly hemiplegia; and they often recur, in slighter grades, during the restoration of the lost power. Spasmodic actions of voluntary parts may result from irritations in their vicinity, or in situations more or less remote, from irritations immediately affecting the nerves supplying these parts, or mediately and indirectly conveyed to them from a distance, as in trismus, tetanus, &c.; and the spasmodic action may be tonic or continued, or irregular or convulsive, or clonic or agitative, or recurring at intervals and occasioning snatches or startings, and various abnormal motions; or it may pass in succession through all those, as in irregular convulsions, in some forms of hysteria, and even in some cases of epilepsy. The spasmodic state, however, is subject to so many variations and anomalies, that it is quite impossible to describe them correctly in all their details at this place. Those diseases, in which spasm, in any of its forms, constitutes a principal element, are fully described, and with especial reference to this morbid condition, under their special denominations; it is requisite, however, to notice certain associations of this condition.

12. iii. *Spasm may affect both involuntary and voluntary parts.* It may extend from one order of parts to the other — most frequently from the former to the latter, if the succession of morbid phenomena be closely analysed, although voluntary parts manifest this disorder most evidently. Spasm, even when affecting most severely the voluntary muscles, may proceed from very remote sources of irritation, as I have shown in several places in this work before the subject was duly considered by any one else. Commencing with those sources which are the nearest to the parts which are morbidly contracted, and concluding with those which are the most remote, we find that muscular structures may experience unnatural action or spasm in some one of its varying forms, — 1st., from irritation in or near the seat of morbid action, as shown more especially in muscular canals — in the digestive, respiratory, and urinary passages; 2d., from irritants affecting the nerves supplying the affected muscles, as evinced in both involuntary and voluntary parts; 3d., from irritation or lesion of the spinal marrow at or near the origins of the nerves supplying these muscles; 4th., from lesion (not necessarily structural) of parts of the brain, or of its membranes, having relations with the nerves going to the convulsed or spastic muscles; 5th., from irritation of any portion of the digestive viscera and canal, or of the generative and urinary organs transmitted by ganglial nerves to the roots of the spinal nerves, or to the spinal cord, and reflected thence by voluntary nerves to the external muscles and members; 6th., from irritation of any of the senses — of hearing, sight, smell, taste, or touch — transmitted to those parts of the nervous centres with which they are respectively in connection, and thence reflected upon parts intimately related to them; thereby producing startings, tremors, sneezing, cough, retchings, or convulsive movements, as either of these senses are irritated or abnormally excited. These several sources of spasmodic action have been sufficiently illustrated in the articles CHOREA, CONVULSION, EPILEPSY, HYSTERIA, SYMPATHY, TETANUS, &c.

13. II. CAUSES OF SPASM. — i. *The predisposing causes* are the same as those fully described when treating of the individual species of spasm, these causes being generally common to all the species, the exciting causes, and the several intrinsic circumstances or peculiarities of the patient determining the form of the attack. Hereditary vice or disposition, congenital conformation, a weak development of frame, the female sex, a warm and humid climate, the ages of infancy, childhood, and puberty, the critical epochs of females, premature sexual indulgence and masturbation, luxurious indulgences and voluptuous modes of living, prolonged indulgence in bed or in sleep, inordinate devotion to music and poetical studies, excitement of the imagination, want of repose, mental anxiety, sleeplessness, exhausting discharges, the sudden suppression of accustomed evacuations, or of external pains; the gouty and calculous diathesis; excited and ungratified, or insufficiently gratified, sexual passions; suppressed emotions; the period of utero-gestation, the puerperal states, abortions, exhausting lactation, inanition; extreme states of vascular plethora, or of anæmia, &c., severally predispose, and often directly produce, some one or other of the usual forms of spasmodic disorder, or such states of spasm as may be considered as anomalous, or different from those commonly described by nosological writers.

14. ii. *The exciting causes of spasm,* whether specific or anomalous, are chiefly influences affecting the mind, the senses, the nervous centres, the alimentary canal and digestive viscera, the sexual and urinary organs, &c.; more especially the violent emotions of mind, whether manifested or suppressed; severe disappointments and losses; strong or strange impressions of the senses, startling noises, disgusting or horrible sights, objects of terror or surprise; violent excitement and the influ-

ence of the imagination: titillation or irritation of the more sensitive parts of the surface, prolonged or violent pain; disordered dentition and dental affections; derangements of the digestive canal, particularly the presence of worms, or of acidity, or of flatus, or of morbid secretions and excretions, or of fæcal accumulations; the passage of biliary calculi, or of disordered bile; irritation or excitement, or functional or structural lesions of the sexual or urinary organs or passages, calculi in the kidneys or bladder; inordinate or prolonged muscular action; various organic lesions or external injuries, implicating either the parts affected, the nerves supplying them, or related portions of the nervous centres or their membranes; sudden or extreme changes of temperature, or electrical conditions of the atmosphere; sudden suppression of discharges, eruptions, or external pain; the drying up of chronic ulcers; the nature of the ingesta, especially acid or unripe fruit, poisonous articles mistaken for food; the poison of lead, and numerous other injurious substances mentioned under the head of POISONS.

15. iii. *The immediate or efficient cause of spasm* — the pathological condition constituting this affection — has been a topic of contention among pathologists. It was generally ascribed to irritation of the nerves supplying the affected muscles, either at their origins, in their course, or at their terminations; or to a sympathetic affection of these nerves propagated from distant but related parts to those thus attacked; or to an irregular distribution through the nerves of the nervous influence or power, and determination of this influence to the affected parts. Towards the close of the last century, RITTER, SPRENGEL, and others, viewed spasm as a result of an alteration of the polarization of the terminations of the nerves in relation to the muscular fibres; and this doctrine, after having been neglected for half a century, has been revived at the present day, and supported by the connection established between magnetism and electricity. This latter theory may admit of a certain degree of practical proof, by having recourse to electricity or galvanism, or of electro-magnetism for the removal of spasm, an energetic recourse to either of these, overcoming, as it does in slighter cases, as shown by my own observation, the morbid condition of the muscles. Nevertheless, the same agencies may be viewed as equally successful in the removal of spasms, on the assumption of their dependence upon the irritation of the nerves in any way related to the affected parts. The *juvantia* cannot always prove the nature of the affection. I have seen, as far back as 1820, the most severe cases of tonic and of clonic spasm produced by the internal strangulation of a minute portion of the small intestines, and by the irritation of worms in the bowels, the violent affection of the voluntary muscles having arisen from those causes and ceased with them, the irritation having been propagated by ganglial nerves to the roots of the spinal nerves, and thence reflected upon the muscles in whch these latter nerves terminated; the history of these and numerous other cases favouring rather the old doctrine of irritation of nervous distributions than the less old and recently-revived theory of altered polarization of the nervous fibres, with relation to the muscular tissue, in producing spasmodic actions.

16. III. DIAGNOSIS OF SPASM.—The existence or non-existence of spasm is in many cases remarkably evident; but, in many others, even as respects some disorders which have been viewed as spasmodic, the evidence is by means satisfactory. As to the insufficiency of this evidence in regard of some disorders, I have already hinted. We have no proof of spasm in any quarter in cases of *catalepsy* of a true pathological form; at least, I could detect none upon a close examination of several cases. The several forms of true *tremor*, as arising either from mental emotion, or from mineral or other poisons, or from functional or structural changes, evince no true indication of spasm. The disordered motion is merely the result of an imperfect determination or transmission of nervous power to the tremulous parts, owing to an insufficient or an interrupted supply of this power from the voluntary or involuntary nervous sources, as either voluntary or involuntary parts are affected.

17. Various *paralysed parts* may present states which may be mistaken for spasmodic affections; and the paralysed state may rapidly pass into the spasmodic, and this latter into the former, which is much the most common. The existence, the morbid relations and the transitions of both these morbid conditions thus become extremely important. *Hysteria*, the *convulsions*, and other spasmodic and anomalous affections of infants and children; diseases of the brain, or of its membranes, in the same class of subjects; diseases or injuries of the spinal marrow, &c.; epilepsy, apoplexy, paralysis, &c., either frequently or occasionally, present more or less of spasmodic action, often passing suddenly or rapidly into one of entire loss of power. The irritation, softening, effusion, compression, or other original morbid change affecting the nervous centres, whilst slight, or in a lesser degree, may occasion only cramps (spasmodic motions), but, when increased relatively to the state of nervous power, may cause the loss of all motion. We thus often observe, that several maladies commence with more or less of spasm, or cramps in the extremities, especially the lower, and soon pass into the paralysed state; apoplexy, epilepsy, paralysis, and various other specific and anomalous affections of the nervous system, manifest in many instances this succession of lesion and of resulting phenomena.

18. Dr. M. HALL is of opinion, that the spasmodic affections ushering in many cases of these maladies commence, or are seated, in the superficial muscles of the neck; and that the spasm of these muscles, by compressing the larger veins, occasion congestion of the brain, and the several consequences of congestion when the spasm is not soon relaxed. He believes that "certain causes and principles, emotions and irritations, act directly or diastaltically upon the muscles of the neck," inducing what he designates "*Trachelismus*": — "If this spasm can be dissolved, all its effects cease more or less perfectly." That the muscles of the neck are affected with spasm in many cases of hysteria, especially in the more severe or paroxysmal, cannot be doubted; and that those seizures which originate in violent mental emotions are often thus characterised, or even thus originate, may be conceded; but the spasm of these muscles is not so general, nor always so early in the procession of morbid phenomena, as Dr. M. HALL supposes. When it does exist, and is either severe or protracted, the consequences which fol-

low are generally serious; and it then constitutes an important portion of the courses of morbid actions and changes, each successive portion being the cause of that which follows it, as it is itself the consequence of that portion which precedes it.

19. Spasm of involuntary muscles must necessarily be imputed to irritation of the ganglial nerves supplying these muscles, or to some alteration in the relations subsisting between the nervous and muscular fibres of the affected part. But when spasm attacks voluntary muscles, the irritation has been generally supposed to be seated in, or to implicate, the voluntary nerves. It is, however, very doubtful whether the spasm of these muscles is so generally caused by irritation of voluntary nerves as is commonly believed. It is very probably so caused in many cases, as shown by injuries of the spinal chord, and by inflammation of this part of the nervous system or of its membranes; but there are various diseases, in which spasm performs a chief or a subordinate part, where irritation of any part of the voluntary nervous system is by no means demonstrable, either the muscular fibres or the ganglial nerves supplying them being much more probably the primary seat of such disorder. In trismus and tetanus, in which the voluntary muscles are so severely contracted, there is no proof that the voluntary nerves are primarily implicated; for volition produces no effect on the spasm, and whatever lesion these nerves present, in some cases merely, may be consecutive much more probably than primary. In the most severe cases of spasmodic cholera, in violent cases of colic or ileres, and in others where a very limited injury is sustained by a portion of intestine, as in partial strangulation, I have seen the spasm of the volunluntary muscles as general as in tetanus, and continue in this state for long periods, and yet the cerebro-spinal nervous system must be inferred to have been free from all irritation but what was propagated to the spinal nerves from the ganglial nerves supplying the digestive canal.

20. IV. THE PROGNOSIS OF SPASM may be most favourable, or the most fatal, according to the seat of spasm, and the circumstances in which it occurs. A spasmodic affection may terminate the life of an infant in a few seconds, especially when it is caused by disease about the base of the brain, or near the medulla oblongata, or thin membranes; or it may cease in a very few minutes, where it is produced by acidity or by any other source of irritation in the alimentary canal. Clonic spasm of the diaphragm may arise, especially in young persons, from the deglutition of a hard or imperfectly masticated substance, or from acidity, flatulence, &c., or it may be the indication of a fatal issue in many acute and even chronic diseases. It may proceed from inflammatory action or irritation of one or more of the digestive organs, or from the sinking of vital power preceding dissolution.

21. Spasm affecting either involuntary or voluntary parts is not attended by danger when it occurs in hysterical or nervous females, or when it cannot be traced to disease or injury of the brain, spinal marrow or their membranes, or to antecedent or existing visceral disease, pectoral or abdominal. When however it has been preceded or is attended by inflammatory action, or by hemorrhage, or even by evidence of congestion of any important organ, or by effusion into any cavity, especially if hæmorrhage has been excessive or effusion great, spasms of any part, and more particularly if they affect the diaphragm, or even the pharynx, œsophagus, or stomach, are a most unfavourable, and generally a fatal, symptom.

22. Spasms of either voluntary or involuntary muscles are always indications of great danger when they appear in the course of malignant or other fevers, and especially in an advanced stage of those fevers, or when they are present in pestilential distempers, or at the commencement of acute inflammation of abdominal organs or at an advanced stage of chronic visceral or structural disease; the amount and imminence of danger depending upon the violence or malignity of the disease, upon the contamination of the blood, upon the stage of the malady at which spasms occur, and upon their seats and extension. Spasms affecting the muscles of the superior extremities are always much more dangerous than those of the lower extremities, and, when they extend from the former to the latter, the danger is extreme.

23. Spasms of voluntary muscles attending gout or rheumatism are readily removed when they are caused by acidity and flatulence, or accumulation of morbid secretions and excretions in the intestinal canal or in the biliary organs; but when in these diseases spasm appears independently of the disorders just mentioned, or when structural change is detected in the heart, or when the state of the urine indicates disease in the urinary organs or passages, more or less danger should be apprehended; and, although present risk may be averted, a future attack, with its contingent danger, may supervene sooner or later.

24. Spasmodic attacks consequent upon protracted lactation, upon menorrhagia, or profuse leucorrhœa, or upon other exhausting discharges, or upon manustupration or venereal excesses, or upon inanition or anæmia, are frequently temporarily removed by treatment; but they return, or assume a more serious aspect, if the morbid condition in which they originate be not removed by appropriate means, or they may pass from the hysterical character, in which they generally first present themselves, into the epileptic or into mania or confirmed insanity.

25. Spasms occasioned by the extent or seat of injuries generally excite great anxiety, and are most frequently attended by danger. But the amount of danger, or even the absence of it, depends chiefly upon the nature and seat of injury, and the amount of vital shock (*see art.* SHOCK), attending it. When the cranium or spinal column is the seat of injury, when there is a penetrating wound or compound fracture, or when vital sinking indicates the violence of the shock sustained by the frame, the presence of spasm not merely complicates the injury, but also indicates its severity, and the imminent danger attending it.

26. V. TREATMENT. — It is obvious that the treatment of spasm should in great measure depend upon the seat and nature of the disease, of which the spasmodic symptoms form either a subordinate or a most prominent part. When the spasm is more than a symptom, depending upon some special malady; when it constitutes an early, predominant or principal morbid condition, either with or without loss of consciousness, it presents,

according to its antecedent or associated and peculiar phenomena, certain special forms, which are described under the several heads of *chorea*, *convulsions*, *epilepsy*, *hysteria*, &c., and for each of which, in its several varieties, the treatment is fully described. It therefore remains only to state those general principles or indications which experience indicates or contra-indicates, under certain circumstances and morbid conditions with which spasm is generally allied.

27. It would appear from what has been stated above, that one or other of the different forms of spasm is contingent upon, or is produced by, one or other of the following pathological states, — 1st, congestion; 2ndly, inflammation; 3rdly, irritation caused by acid, acrid, or otherwise disordered secretions and excretions; 4thly, a contaminated state of the circulating fluids; 5thly, some structural lesion or injury affecting adjoining or remote nerves or the origins of nerves; 6thly, extreme exhaustion of organic, nervous, or vital power; 7thly, the excessive action of muscles, and the contraction of muscles independently of a co-ordinate or sufficient determination of volition to them; 8thly, punctures or other injuries of tendons, nerves, or fibrous membranes; 9thly, the irritation of the sexual or urinary organs; and 10thly, two or more of these states conjoined. It will be seen, from a consideration of these antecedents, that spasm is most commonly a symptom of certain disordered or morbid conditions, to which attention should chiefly be directed in its treatment, and that it is only when produced as just indicated in the seventh and eighth of the above series of causes or circumstances, that spasm can be considered as a primary or idiopathic disease. (See arts. Tetanus and Trismus.)

28. *A. Congestion*, in connexion with spasm, may be viewed both as an antecedent and associate of this latter condition. It may, moreover, be further associated, as with irritation or some structural lesion; and as long as these are in existence, so long may the spasm continue or recur, as various concurring causes may favour its return. The existence of congestion is often difficult to determine; for when the spasm implicates any part of the respiratory apparatus, or when it is so general as to give rise to convulsions, with or without loss of consciousness, the congestion which is then made manifest is more the result of the spasm than the cause of it. Congestion of the brain, or near its base, especially if consciousness be lost, and congestion of the lungs and cavities of the heart, are common effects of general spasm or convulsions, especially when any part of the respiratory passages is affected. Congestion may certainly exist in either organ antecedently to either spasm or convulsion, for it is frequently the cause of both; but the spasm may increase the congestion, and it may even be the cause of relaxing the spasm when the congestion becomes extreme. This latter effect takes place chiefly in extreme congestion of the brain, when consciousness is lost; the congestion, in connexion with the circulation of imperfectly oxydised blood in the brain, both relaxing the spasm and permitting the renewal of air in the lungs. The more moderate congestion in these cases first occasions spasm or convulsions; but when the congestion of unoxidised blood, increased by the convulsions, becomes extreme, then the spasms are relaxed and altogether resolved, and either natural respiration is resumed, or death takes place from the cessation of respiration, owing to the effect produced by the congestion at the origins of the respiratory nerves. In cases of spasm, thus arising or thus associated, the treatment must be directed by the following intentions: namely, 1st, to diminish or remove congestion by means which experience has shown to be most efficacious in obtaining this object; 2ndly, to prevent the recurrence of this condition and its contingent effects.

29. *a.* Spasm depending upon or connected with congestion of any vital or important organ has been too generally treated by large vascular depletions, both general and topical. In young, robust, and plethoric persons, and when the spasms have been consequent upon the stoppage of accustomed discharges, both the one and other mode of depletion may be employed, but with extreme circumspection, more especially during the attack. In most even of these cases, local depletions are the safest and most efficacious; for when the circumstances just mentioned as warranting the depletion are not manifestly present, or when the patient is of a nervous temperament, either the local depletion should be small, or it should be altogether dispensed with, and other means be chiefly confided in. When local depletions are indicated, cupping is the most beneficial; and when the loss of any blood is justly dreaded, then dry-cupping may be resorted to. The circumstances indicating depletions, as well as those contra-indicating them, require for their recognition great discrimination, guided by an enlightened experience, and are such, in their natures, complexities, and varied successions and associations, as to be estimated correctly only at the moment by the closely observing physician. When therefore there is any doubt as to the propriety of bloodletting, it will be preferable to resort to dry-cupping, and to emetics and purgatives, conjoined with stimulants and antispasmodics, — with these latter more especially when nervous energy is much reduced or originally weak.

30. *b. Of emetics*, especially when spasm is imminent, or when it attacks any part of the respiratory apparatus, the most energetic is the *tinctura Lobeliæ*, or *Tinct. Lobel. Ætherea*, given with vinum ipecacuanha to ensure its emetic operation, or with sulphas zinci. When vital or nervous power is much reduced, it may be given with spiritus ammoniæ aromaticus, or with camphor. When bloodletting is manifestly indicated, or when congestion of, or vascular determination to the brain is urgent, then depletions and derivatives, as mustard pediluvia, should precede the exhibition of an emetic; and the affusion of cold water on the head, or cold sponging, may also be practised, the emetic operation and the relaxation of spasm being often promoted by these means. When congestion of the liver is connected with spasm, local depletion or dry-cupping, or both, are often required, and then the preparations of colchicum may be given, at first in a large dose, either with or without an emetic conjoined, and afterwards relinquished for purgatives and antispasmodics. The operation of the first dose of colchicum should be carefully watched, particularly when large, and, if vital depression follow it, stimulating antispasmodics, as ammonia, camphor, valerian, &c., be exhibited. The spasms or

convulsions which sometimes occur on the invasion of exanthematous fevers, are often connected with congestion; and for these an emetic and a warm bath are often of service.

31. *c. Purgatives* are generally beneficial, more especially when the liver or brain is congested, and when the spasm is connected with acidity and flatulence of the digestive canal, or with accumulations of morbid secretions, excretions, and fæcal matters, as when spasms occur in colic or in the course of gout, rheumatism, hysteria, hypochondriasis, &c. In these, as well as in some cases of other diseases, not only are morbid excretions thus liable to accumulate, but the blood becomes more or less contaminated by effete materials, which the impaired functions of the emunctories fail of removing. In these circumstances, purgatives should be selected with the view not merely of evacuating the contents of the bowels, but also of promoting the functions of excreting organs. When cerebral congestion is connected with spasms, then active derivative purgatives ought to be exhibited by the mouth and in enemata, and with this view, as well as with the intention of removing spasms by one of the most powerful antispasmodics that can be prescribed, a full dose of spirit of turpentine should be given with castor oil, or with other purgatives, and administered in an enema. When the liver is congested or torpid, as may in many cases be ascertained by percussion, then calomel with camphor, and various other chologogue purgatives, will be most appropriate.

32. *B.* When the spasm is contingent upon *Inflammatory Action*, recourse to vascular depletions, general or local, is commonly required; and what has been stated above (§ 29.) respecting bloodletting is also here applicable to a great extent. It should always be recollected that inflammations accompanied with spasm or convulsion rarely admit of vascular depletions to the same amount as will be safely and advantageously borne in pure uncomplicated inflammation. Indeed the depletions may even increase the spasm without materially diminishing inflammation when injudiciously employed, or when confided in chiefly, and when the inflammation is of an asthenic character. In this latter state more especially, and in other circumstances of this morbid alliance, deobstruent purgatives, conjoined with stimulants and antispasmodics, are required; and even in cases where vascular depletions are most indicated, not merely such purgatives, but also stimulating antispasmodics, may be most beneficial, with other restoratives which the peculiarities of the case will suggest. In some instances an emetic, judiciously selected and combined, will also be of much service, after depletion has been resorted to, when clearly indicated. In the worst form of spasm, as in that contingent upon asthenic or cachectic inflammation, for which bloodletting is generally more injurious than beneficial, the early exhibition of an emetic, followed by purgatives, and by tonics conjoined with alkalies, antispasmodics, counter-irritants, &c., will be found more certainly useful than other means.

33. Spasms of the voluntary muscles, either limited or more or less extended, are often produced by inflammation at or near the origins of the nerves supplying the affected muscles, or by inflammatory action, or irritation of the membranes in the vicinity, or by disease of the adjacent bones, as shown when treating of lesions of the *brain*, *spinal chord*, and *membranes*, or of the *cranium* or *spinal column;* and for these, although general or topical bleeding may be requisite, according to the nature and features of the case, purgatives, alteratives, derivatives, counter-irritants, sedatives, and the other means fully set forth in these articles, are especially required.

34. *C.* The dependence of spasm on *acrid, morbid, or other irritants in the digestive canal*, is of frequent occurrence, both primarily and unconnected with any special malady, or so associated, as in gout, hysteria, &c. In all these circumstances, emetics, purgatives, anthelmintics, &c., as above recommended (§§ 30. *et seq.*), are indispensable. In the gouty and rheumatic diathesis, equal parts of magnesia and sulphur, taken on several occasions, and followed by a more active cathartic, will be found efficacious; and if there be reason to infer the presence of worms, the spirit of turpentine with castor oil, or anthelmintics, purgatives, &c., will be generally indicated; but they should be afterwards followed by chalybeates, tonics, and antispasmodics, as recommended in the article on Worms.

35. Irritation of the higher portions of the alimentary canal by the irruption of acrid bile into the duodenum often occasions spasms of the abdominal muscles, and calves of the legs, but these generally subside after the evacuation of the morbid matters; dilution of the acrid secretions by warm emollient fluids, narcotics subsequently, and mild purgatives afterwards, effecting a complete cure, generally in a short period. (See Cholera, &c.)

36. *D.* Spasm is not frequently occasioned *by contamination of the circulating fluids*, unless at a far advanced period of febrile and pestilential diseases, as in pestilential cholera, and when the functions of the kidneys are impaired, interrupted, or otherwise disordered. In these circumstances vital power requires support, whilst morbid matters are evacuated, and the actions of the depurating organs are excited by their appropriate stimuli. We should, moreover, endeavour to change or counteract the influence of those materials which thus accumulate in the blood,—to remove or neutralise them. They can be removed only by increasing the functions of the emunctories, and they may be neutralised by appropriate alkaline or mineral agents, and by antiseptic and antispasmodic medicines, as recommended when treating of the maladies in which spasms are most frequently observed.

37. *E. Structural lesions, injuries,&c.* of the bones, or membranes near the origins, or in the course of, the nerves supplying the extremities or voluntary muscles not infrequently occasion spasm of these muscles, and require the means already recommended (§§ 29. *et seq.*), modified according to the nature of the lesion or injury, and to the peculiarities of the case in other respects. In these states of disease the performance of the several excreting functions requires especial attention, and the evacuations a particular examination.

38. *F. Extreme exhaustion of vital or nervous power*, causing spasm or irregular or convulsive actions of voluntary muscles, or of involuntary parts, is often irremediable, especially when it appears at an advanced stage of pestilential or febrile mala-

dies, or after large losses of blood, and in the course of exhausting or contaminating diseases. In these circumstances powerful stimulants and antispasmodics—wine, opium, camphor, ammonia, oxide of bismuth, ammoniated copper, cajuput oil, phosphoric acid, the preparations of sumbul, arnica montana, the ethers, brandy, &c. — are necessary, and one or more of these may be conjoined with such preparations of iron, or of assafœtida, or of valerian, of zinc, of silver, of phosphorus, canabis Indica, or of musk, castor, &c., as the peculiarities of the case will suggest.

39. *G.* When spasm or cramp is caused *by excessive action of the affected muscles*, or by contractions of muscles without a due determination of volition, it generally soon ceases, and requires merely frictions and quiet. If it recur, friction with stimulant liniments, the application of warm embrocations near the origins of the nerves or portion of the spine enclosing these origins; frictions with chloroform or æther, or with turpentine and camphor, either over the affected muscles, or along the spine; and subsequently the cold douche or affusion, or sponging the spine night and morning with a tepid or cold solution of bay-salt, followed by gentle friction with the hair glove, &c., will generally prevent a recurrence of the spasm.

40. *H. Punctures or injuries of tendons, &c.*, are occasionally followed by trismus or tetanus, the most continued and dangerous form of spasm, and one which requires, more than almost any other disease, the most energetic stimulants, antispasmodics, and tonics; the powerful doses of sedative and narcotic substances generally resorted to for this affection tending rather to hasten than to avert dissolution. (See arts. TETANUS and TRISMUS.)

41. *I.* The *influence of the sexual organs* in producing spasm or convulsion is especially manifested by the female. But there are often other morbid conditions present besides either irritation, congestion, or inflammatory excitement, or vascular determination of these organs. Generally nervous power, especially organic nervous power, is exhausted or depressed, the secretions disordered, and the excretions insufficient or retained; consequently assimilation is impaired, and the blood poor. The affection of the sexual organs is readily induced by mental emotion or desire; and this affection reacts upon the brain and nervous system generally, is propagated by the ganglial system to both the abdominal and thoracic viscera, disordering the functions of the urinary organs, occasioning spasmodic actions of the alimentary canal, respiratory organs and passages, and often exciting spasms or convulsions, or both, by the extension of the irritation to the roots of the spinal nerves, and even to the spinal marrow, medulla oblongata, and brain.

42. The treatment hitherto recommended in these cases has consisted chiefly of stimulants and antispasmodics, and have been but insufficiently directed to the sexual organs and to the mind. The morbid or irritated state of these organs should be removed, and sexual desires suppressed. Instead of stimulants and heating antispasmodics, cooling medicines, as nitre, small doses of camphor, magnesia, alkalies, &c., should be given in bitter infusions, and the mind ought to be occupied agreeably and profitably. When spasmodic affections occur in females or males, especially if the countenance become pallid or sallow, then the most noxious vice of all vices should be suspected, namely self-pollution (see arts. DEBILITY and POLLUTION); and unless this be relinquished, and the mind be healthily and morally regulated, medical treatment will be of no avail. (See arts. CHOREA, COLIC, CONVULSIONS, EPILEPSY, and HYSTERIA.)

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SPINAL COLUMN, DISEASES OF.—

SYNON. — *Vertebral column; Columna vertebralis; C. spinalis*, Auct. Var. *L'épine du dos, Rachis*, Fr. *Der Rückgrat*, Germ. *The Spine, Spinal Chord, and Membranes.*

1. I. PRELIMINARY REMARKS: — The spinal column has attracted to itself a due proportion of attention from medical writers only in comparatively recent times. The diseases of the several tissues, of which this column and its contents consists, were either altogether unknown, or overlooked, or if partially known, undeservedly disregarded, until J. P. FRANK, in 1791, published his celebrated treatise on the great importance of this part of the frame in disease. Previously to this period, disorders and lesions of the spinal column and chord received only partial and very imperfect notices from medical and surgical

writers. Some mention of the functions and diseases of these parts is to be found in the works of HIPPOCRATES, GALEN, ARETÆUS, and CELSUS; but the structure and functions displayed by them, more especially by the spinal chord, were very imperfectly investigated and understood, until BARTHOLIN and BLASIUS entered upon this undertaking. VIEUSSENS afterwards, HUBER subsequently, and MONRO, FROTSCHER, LUDWIG, GALL, and HOME, at later periods, cultivated still further this field of research. Injuries and diseases of the vertebral column were treated of by POTT, PALETTA, SOEMMERING, C. BELL, A. LOUIS and others; whilst the maladies implicating chiefly the spinal chord and its membranes were illustrated successively by VOGEL, PORTAL, BERGAMASCHI, BRERA, AUTENRIETH, MUSSY, SCHMALZ, RACCHETTI, CHOULANT, OLLIVIER, BRODIE, the author, and others; but it was not until the researches of C. BELL, MAGENDIE, M. HALL, VALENTIN, STILLING, VAN DEEN, BUDGE, &c., had thrown additional light upon the structure and functions of the chord, that the diseases of this organ and of its envelopes have been duly illustrated. Even at the present time, it is doubtful whether or not these diseases have received the full amount of investigation, which they have so long required. The reader will find, in the sequel, an account of the works furnished not only by writers now enumerated, but also by many others, who have contributed more or less to the present advanced state of our knowledge of diseases of the spinal column, and of the very important tissues which this admirable structure contains and protects.

2. *A.* It may not be disadvantageous to take *a brief survey of various topics connected with the pathology of the spinal column, and of the parts which it contains, especially in relation to certain agencies, and to other maladies, with which affections of these structures are often more or less intimately associated.*

3. *a.* During the several forms and stages of *fever*, periodic, continued, exanthematous and malignant, the functions of the spinal chord are more or less impaired or disturbed, as evinced by the pains in the back, loins, and limbs, and by incapability of assuming the erect posture, or even of moving. In the early stages of these maladies, these symptoms are manifestly due chiefly to congestion of the veins and venous sinuses of the vertebral canal, and to disordered circulation in the chord and its membranes; but, at more advanced stages, the morbid or contaminated state of the blood itself, and the failure of vital power generally, still further increase the deficiency of voluntary motive power, paralysing not only the limbs, but affecting more or less, through the medium of the branches of spinal nerves communicating with the ganglial and visceral nerves, the functions of the several internal organs, and especially of the urinary and genital.

4. *b. Rheumatism* and *gout*, the former especially, may attack, by metastasis or otherwise, the membranes of the spinal chord, and by the effusion of lymph between them greatly impair or entirely abolish either motion or sensation, or both, in parts supplied with nerves from or below the seat of effusion. A similar succession of disease may occur in the course of various acute eruptive maladies, although much more rarely.

5. *c. Scrofula*, *tubercles*, and *rickets* very frequently attack the spinal column, generally the bodies of the vertebræ, and produce the most serious effects not only upon these, but not infrequently also upon the membranes, the spinal chord itself and the roots of the spinal nerves, causing the several sympathetic disorders which will be described in the sequel. The affection of the spine may, in scrofulous subjects, be the only serious manifestation of the scrofulous taint, or it may be associated with, or consecutive upon, other outbreaks of this taint, in the form of tubercular infiltration or other structural lesions.

6. *d.* The affection of the spinal chord and membranes may be connected with *disorder of the sexual and urinary organs;* and, although the more severe affections of the former generally disturb or abolish the functions of the latter, serious or protracted disorders of the urinary and sexual organs not infrequently excite important lesions of the spinal chord. This latter procession of morbid phenomena admits of ready explanation. Exhausting seminal and other discharges from the genitals depress vital power generally, impair the requisite nutrition, and regeneration of the nervous influence of the chord; and thereby not merely weaken remarkably the functions of this organ, but affect its intimate organization, favouring softening or other structural change. Irritation also of the sexual organs, and of the urinary organs also, may be propagated by the communicating branches of nerves to the spinal chord, and, when thus extended and perpetuated by a continuance of the cause of irritation, serious lesions may be reasonably inferred to arise not only in the chord itself, but also in its several envelopes, and even in the bloodvessels lodged between these envelopes and the bodies of the vertebræ.

7. *e. Inflammatory affections of the nerves*, especially of those of the lower limbs, may extend even to the spinal chord or membranes, and produce in these similar changes to those which follow the metastasis of rheumatism or gout to these structures, or the suppression of eruptions, &c. This succession or extension of disease is rare, but a few instances have come under my observation, especially the extension of inflammatory sciatica to the sacrum and back, and the supervention of spasms, followed by loss of motion, &c.

8. *B. There are various symptoms, circumstances and complaints, several of them appearing obscure or anomalous, which ought to direct our attention to the spinal column, and lead to a very careful examination of its state and functions.* — *a.* The *voice* and *respiration* are often affected when the upper portion of the medulla or chord is in any way implicated in disease. I saw some years ago a gentleman who had been seized when a young man with hemiplegia, the speech, tongue, and muscles of the face having been affected. He was subsequently quite restored to health, and presented no indication of paralytic affection, and had for many years pursued his profession. But on the last occasion of his consulting me he complained of a form of hoarseness, or state of voice, which had been treated by more than one physician as a chronic laryngitis. I had arrived at first at the same conclusion; but an examination of the chest, throat, and neck, attention to his arti-

culation and voice, and the previous history of the case, convinced me, that the affection was more paralytic than inflammatory, and that he was in imminent danger of an attack of asphyxia, of apoplexy, or general paralysis, from lesions about the medulla or base of the brain. The treatment was directed accordingly; a seton was placed in the nape, but he died suddenly some time afterwards. The affection of the functions of respiration, and even of the actions of the diaphragm consequent upon disease of the medulla, or of its envelopes, was known to Galen.

9. *b.* Since the days of Galen (*De Locis affectis*, l. iii. c. 10.), the influence of the medulla oblongata and spinal chord upon respiration and the actions of the *heart* was overlooked until Vernay, Morgagni, Eller, Zinn, Le Gallois, Prochaska, Brodie, and more recently W. Phillip, C. Bell, and M. Hall, directed especial attention to the subject. The last-named writers, however, imputed the action of the heart entirely or almost wholly to the nervous influence of the medulla, overlooked the more important influence of the organic or ganglial nerves abundantly supplied to the heart and respiratory organs, and directed their attention chiefly to, and over-estimated, the spinal nervous influence, which only reinforces and modifies the more important and greater — the more vital power—which the heart and lungs receive from the other source just named. There is no doubt that the mechanism of respiration — the respiratory muscles, are more especially influenced and actuated by the medulla and chord; and that whatever interrupts or intercepts the nervous influence from these sources, or from the more basilar and central parts of the brain, by causing asphyxia, soon arrests the actions of the heart. That the contractions of the heart may be rendered more energetic, more tumultuous or impulsive, either by mental emotion, or by irritation of the sources of nervous influence now named; or, on the other hand, that these contractions may become more slow, more weak, and even more irregular and intermittent, until death may supervene with more or less rapidity, owing to a defective or an interrupted, or an intercepted transmission of nervous influence from these sources, cannot be disputed. In cases, therefore, which present disordered action of the heart, of whatever kind, not only should this organ itself be carefully examined, but also the state of the spine, as far as that may be done, and the several manifestations of organic nervous influence, as displayed by the several digestive, assimilating, and excreting functions.

10. *c.* The abdominal muscles are subject not merely to *cramps* and *spasms* when the medulla spinalis or its membranes are diseased, but, even independently of cramps, the patient often complains of a remarkable increase of the sensibility of the cutaneous surface, of a sensation of girding or *constriction* around the abdomen or base of the thorax, subsequently of impaired sensation and motion, with great constipation of the bowels, retention of urine, and various other symptoms, according to the portion of the chord which is implicated. (See art. Paralysis.)

11. *d.* The limbs are often the subjects of *cramps*, or permanent *contractions*, often with an intervening sensation of *prickings*, numbness, and peculiar modifications of sensibility, especially near the points of the toes or fingers, with a sense of weight and numbness of the legs and feet, or of the whole limb. Occasionally these sensations are felt on one side only, or in both, or more severely in one than in the other; and, although they often precede an attack of gout, they frequently are precursors of organic lesions of the chord or its membranes, and thus usher in an attack of paraplegia, or inflammation of the chord and its membranes, or accompany inflammation of the intervertebral cartilages, or caries of the bodies of the vertebræ.

12. *e.* More or less *severe pain* or *neuralgia* may be complained of, in some remote part from the spine, or in one or more limbs, often in the extremities, but as frequently deep-seated in the middle of the thighs, or in the abdominal muscles, or between the ribs, the pain often admitting of being traced to the origin of the affected nerve in the spine. The effect of position upon the pains—of standing, or sitting, or lying down in the prone or in the supine position; and the periods of the day or night when they are most acute, ought to be carefully ascertained. In cases of inflammation of the chord, or of its membranes, or of the bodies of the vertebræ, the pain is much increased towards morning and after lying upon the back, and extend around the abdomen and down the limbs, with at first retention of urine, constipation, and subsequently loss of power of the sphincters. If, however, the inflammation be slight, and the patient has not retained the supine posture during the night, the pain may be diminished in the morning, owing to augmented capacity, by elongation, of the spinal canal.

13. *f.* The state of the *sexual functions* are often much disordered in diseases or injuries of the spine or of the chord. Whilst masturbation, or sexual intercourse, when excessive, may impair the nutrition of the chord, and induce disease both of it and its membranes, the latter occasions, particularly when the lesion is low in the chord, loss of sexual power, and incontinence of urine. Injuries or acute disease in the cervical portion of the chord are often attended by priapism.

14. *g.* The above and other phenomena, which will attract the attention of the observing physician, will always suggest to him the necessity of having recourse to a careful examination of the spine; and even when none of the above is present, the patient, however, presenting unusual debility, or impairment of activity or motion in the lower extremities, or great weakness or trembling of the knees, with a bent, staggering, or unsteady mode of progression, emaciation of the lower extremities, relaxation of the ligaments of the joints, &c., the experienced observer will infer impaired nutrition and function of the spinal chord, either from the exhaustion produced by masturbation or excessive sexual indulgence, or from congestion of the venous sinuses of the vertebral canal, or from incipient softening or other structural change in the chord, or in its membranes.

15. *h.* *An examination of the spinal chord* should be commenced with a careful inspection of it in various positions — whilst standing erect, whilst the trunk is bent to either side, and when the patient is prone. The effect of bending or turning quickly to either side should be observed; for, even in incipient caries of one or more bodies of the vertebræ, the patient sometimes experiences a

sensation, grating, or crepitation, on making any of those changes of position. The sensibility of the surface of the trunk and limbs, the temperature and state of the skin, and the degree of rapidity with which volition is conveyed to the extremities ought to be noted. The clavicles, the ribs, the sacrum, the crests of the ilia and hips, should also be noticed, in respect of their particular states, and of their relations to the spine; for by their aid, relative position, and direction, incipient states of curvature may be ascertained. The effects of pressure and of percussion over the spinous process of each vertebra, and over the outlets of the spinal nerves, should be carefully observed. It has been supposed that the pressure of a hot sponge directed over the vertebræ will detect subjacent lesion, and point to its exact seat when other modes of having recourse to pressure will fail. I have not observed much advantage from this mode of examination, but it need not be neglected; inasmuch as the more fussy and the more particular, and the more singular the mode and means of examination resorted to, even when the nature of the case is as clear as sunshine, the more they will attract the observers, both interested and disinterested, and accord with the prevailing ad captandum minuteness and professional manipulations of the day. If there be no occasion for a graceful display of the stethoscope—and when may not such be necessary, or made apparently requisite? And if there be no requirement for the introduction of the speculum — and when, indeed, should the phalloid instrument be neglected, if the patient be a female!—let us by all means have recourse to some other medium of communication between the patient and doctor — some new instrument of legitimate medical charlatanry—that may strike, if not amuse or gratify, the former, and recommend the latter. How is it that, amid the remarkable number of spine-doctors and writers on spinal curvatures for the benefit of a discerning public, no one has invented a pocket instrument for examining and straightening the spine? Or, has one been actually invented, but, having been always applied *a posteriore*, no one besides the inventor and manipulator has yet been able to detect the excellence or penetrate the mysteries of the invention?

16. II. The Causes of diseases of the Spinal Column, Membranes, and Chord, are generally sufficiently manifest; but they are occasionally more or less obscure, especially as regards the extent of their individual influences. As the causes of disease of the several structures composing the spine are almost common to each variety or form of malady to which these structures are liable, although certain of the causes affect one tissue in preference to the others, I shall, therefore, devote a due consideration to all of them, with such notices of their effects as may best subserve practical purposes.

17. *A. Improper physical education and clothing* comprise a great variety of circumstances and causes productive of curvatures, and even of more acute disease of the spinal column; and, although this class of causes operate chiefly in childhood and early life, yet their effects often continue until old age, and are rendered more severe and irremediable by the regimen and clothing adopted during puberty and adult age. In this climate more especially, the frequent and sudden vicissitudes of temperature and humidity require that the body—both trunk and extremities—should be covered in such a manner as to preserve the surface in a sufficiently warm and perspirable state, avoiding any excess or extreme of cold or warmth, and to allow a free and easy exercise of all the muscles of the extremities and trunk. Thus clothed, and avoiding all cinctures or corsets, or other baneful contrivances introduced by ignorant dogmatisers, from the period of infancy upwards; exercise in the open air and in sunshine; sufficient but not immoderate or improper food, are the means which will best ward off affections of the spine, and in proportion as either of these is neglected, so will a predisposition to these affections be generated.

18. The use of stays or corsets of any kind during childhood, and exposure of the joints to cold, are amongst the greatest evils to which the human race is liable. The former embarrasses and limits the actions of the dorsal and lumbar muscles, and of all the muscles of the trunk, weakens and relaxes the vertebral ligaments, and whilst it favours unnatural curvatures, endangers more or less the important parts lodged in the vertebral canal: the latter weakens and enlarges the joints, and depresses vital power. The want of due air and proper exercise from the age of five years to twenty; the mental cramming pursued during the greater part of that time; the prolonged periods of study in a crowded and insufficiently ventilated apartment; sleeping in a self-contaminated air, and in chambers overcrowded or too small for the number of occupants; insufficient, or unwholesome or incongruous food, are very generally associated causes of the delicacy of constitution, of the weak or imperfect development of muscle, and of the relaxation of ligaments, which both predispose to, and even directly occasion, spinal curvatures and disease. The vice of self-pollution, moreover, which is apt to spring up and diffuse itself in young persons about the age of puberty, when they live in considerable numbers under one roof, remarkably aid these causes in developing their effects upon the nervous system and spinal column; but to this most important agency more particular attention will be paid in the sequel.

19. In connexion with the use of stays, the usual mode of their construction requires some notice. Whilst they are so made as to press downwards and together the lower ribs, to reduce the cavity of the chest, especially at its base, to press injuriously upon the heart, lungs, liver, stomach, and colon, and even partially to displace these vital organs, they leave the upper regions of the chest exposed—those very regions where tubercular, consumptive, bronchial, and inflammatory diseases generally commence, or are the most prone to attack—to the vicissitudes of season, weather, temperature, humidity, and external injury. These noxious and unnecessary articles of clothing — these mischievous appliances to the female form, useful only to conceal defects and make up deficiencies in appearance, are rendered still more injurious by the number of unyielding, or only partially yielding, supports with which they are constructed on every side. There are the whalebones in the back and sides, and the steel in front, extending from nearly the top of the sternum almost to the pubes. The motions of the trunk and

spine are thereby restrained, and the nutrition of the compressed parts impaired; but, irrespective of the displacement of vital and assimilative viscera that follows the amount of pressure, the metal support in front has an injurious effect, which has been universally overlooked. However well it may be protected from contact with the surface, it acts as a conductor both of animal warmth, and of the electro-motive agency passing through the frame: it carries off by its polarization, into the surrounding air, especially during humid states of the atmosphere, the electricity of the body, this agent being necessary to the due discharge of the nervous functions, either in its electro-galvanic, or magneto-electric, state or manifestation. The injurious influence of stays on the female economy, as respects not only the diseases of the spinal column, but also the disorders of the uterine organs, is manifest to all who consider the subject, and has been ably discussed in a work by Mr. WHITFELD of Ashford, to which I refer the reader.

20. *B. Constitutional vice and diathesis* especially favour the occurrence of, and even directly occasion, diseases of the spinal column. Of these the most influential are the scrofulous, the rheumatic, and the cancerous. Scrofula, either latent or developed — whether concealed or tuberculous — often produces disease of the bodies of the vertebræ, either in the form of scrofulous inflammation of them, or by infiltrating their cancellated structure with tubercular matter. The *causes of scrofula*, fully discussed in another place (see *art.* SCROFULA, §§ 13. *et seq.*), have in many instances the effect of developing disease of the spine without having previously changed the diathesis or habit of body, at least in an obvious manner. In such cases, they are often only predisponents to such disease, some other agencies exciting it. Whilst scrofula chiefly causes disease of the vertebræ, the rheumatic diathesis, or pre-existing rheumatism, favours the occurrence of rheumatic inflammation of the ligaments of the spine, or rather of the sheath and membranes of the chord. Inflammation of these tissues may appear either as a metastasis of the rheumatic attack, or primarily upon exposure to cold or wet, or to currents of cold air in this quarter. The gouty diathesis is not so frequently a cause of spinal affections as rheumatism; but congestion of the venous sinuses of the spinal canal, causing pain in the back and loins, and feebleness of the lower extremities, is a frequent complaint in gouty persons. The cancerous diathesis has probably little influence in the production of spinal complaints, although the several varieties of cancerous disease have been occasionally found to implicate one or more of the spinal structures. Children, whose parents are aged or debilitated, and whose conformation is originally weak; the progeny also of the dissipated, the drunken, or the exhausted by syphilis, mercurial courses, or cachectic affections; a rapid or premature growth, and children brought up by hand, or living in large towns without the advantage of occasional change of air; are much more liable to spinal affections, than others differently circumstanced, as they advance in growth or age.

21. *C. Certain previous maladies*, especially those above-mentioned, exanthematous and malignant fevers, more particularly scarlet fever, the syphilitic cachexia, tuberculous disease, sexual and urinary affections, particularly in the female, aneurisms of the aorta, and internal tumours and abscesses, either favour the development or excite disease of the spine, or of its contents. Aneurisms of the aorta, and internal tumours and abscesses in some instances, by their size and pressure, occasion erosion or ulceration of the bodies of the vertebræ. Flexures of the spine and disease of the vertebræ frequently follow the more severe attacks of the exanthemata; and tuberculous disease with caries of the vertebræ, sometimes followed by abscess, is frequent not only in the scrofulous diathesis, but after tuberculous affections have been developed in the lungs, mesenteric glands, or in other parts.

22. Uterine irritation and excitement, and the several forms of hysteria, and their numerous manifestations and alliances, are often followed by congestion of the venous sinuses of the vertebral canal; by what has usually been called spinal irritation, or inflammatory congestion or irritation of the chord and its membranes; and by flexures of the spine or structural change of the contents of the column. Frequent sexual excitement and consequent exhaustion, alternating with unnatural rapidity, are the most frequent causes not only of these uterine and hysterical disorders, but also of the allied affections of the spine and its contents: and, although the one class of disorders is generally consecutive of the other, the spinal diseases with their several sympathies more commonly following the sexual, the former may be primarily manifested, especially in the male sex; masturbation about the period of puberty, and premature or excessive sexual indulgences, being the most common causes of chronic disease, the most injurious of vices, mentally and physically, and, whilst they most powerfully predispose to, they directly occasion, especially in weak constitutions, and when aided by other causes, one or other of the more serious maladies of the spine and its contents. (See *art.* POLLUTION.)

23. *D. The influence of physical agents*, especially of cold, currents of cold air, unusual increase of temperature, more particularly if these be applied to the back; sleeping in damp beds or upon the ground, or in the open air, with exposure of the back; sitting in wet or damp clothes; exposure of the back or loins to much heat, especially during dinner; sudden suppression of the perspiration by exposure to cold or to cold air, as when a person is called out of a warm bed. A medical man was called out of bed when perspiring freely, and got into an open carriage insufficiently protected, during a cold night. He was soon afterwards seized with inflammation of the membranes of the spinal chord. I attended him with other physicians. A corpulent female of middle age slept with her back to a window which had been left partially open. She complained of chills, pains, and rigors, during two or three following days, subsequently of acute pain in the loins, pain, numbness, and cramps in the lower extremities, and other symptoms of inflammation of the spinal membranes. She afterwards became paraplegic. A gentleman from Jamaica, after a hot day, fell asleep at night on the deck of the ship in which he was making his passage to Europe. He awakened cold, shivering, and benumbed, and was soon afterwards generally pa-

ralysed. A gentleman dined at a party where he was a stranger, and did not complain of the heat of the fire at his back. The following day and the next he had frequent vomitings, violent pain in the back and loins, numbness, pain, and cramps in the legs, obstinate constipation and retention of urine, followed by paraplegia. I could adduce numerous instances similar to the above which have occurred to me during a practice of upwards of thirty years. The causes which I have mentioned under this head, as well as those which follow the next to them, generally affect primarily or chiefly the membranes of the spinal chord, the affection of these and its consequences generally implicating more or less the chord itself and the origins or roots of the spinal nerves.

24. *E. The metastasis and suppression of external disease or accustomed discharges* have been partially noticed above. During an early period of my practice, I observed several cases of this occurrence, chiefly at the institutions to which I was physician. In one case of metastasis of rheumatism to the spinal membranes which I treated in 1820, general palsy supervened, and I had an opportunity of minutely examining the spine and its contents after death (*see Lond. Med. Repos.*, vol. xv.). Since that period similar cases have come under my observation, which have terminated either in paraplegia, or in general palsy and death. Suppression of the catamenia, the stoppage of profuse leucorrhœa and of hæmorrhoids, the drying up of accustomed discharges, the healing of chronic ulcers and cutaneous eruptions, have severally been followed by disease of the spinal contents. In many of such cases the blood has been more or less impure—has been insufficiently depurated by the several emunctories; and when the manifestations of this morbid condition have been suppressed in quarters which served as safety valves from more dangerous consequences, they have broken out in other surfaces and parts, and been followed by much more serious results; and although the spinal membranes and chord may not be frequently thus consecutively assailed, yet they are occasionally, when the suppression of the primary disease has taken place before the blood has undergone depuration by an increased action of the excreting organs. We frequently observe surgeons endeavouring to cure eruptions, ulcers, chronic discharges, &c., by lotions, ointments, cerates, and other appliances, either unsuccessfully or with the contingent result of consecutive internal disease when they succeed; whereas, a decided action on the several excreting organs, by appropriate means, by removing effete or injurious elements and materials from the blood,—by counteracting or eliminating those irritating and self-contaminating matters perpetuating or causing the primary disease,—would most speedily and effectually remove it, and prevent any subsequent risk from metastasis or other morbid manifestation.

25. *F. External injuries* are amongst the most common causes of disease of the spine, or of its contents. These injuries may be so slight as to be overlooked or forgotten, their effects being developed slowly and insidiously until they arrive at a pitch which alarms either the patient or his medical attendant. The more severe injuries by which a vertebra is broken, or its intervertebral cartilages torn, or ligaments or muscles ruptured, and the chord or its membranes either more or less injured at the same time, or consecutively affected by inflammation, effusion, &c., readily account for the great extent and danger of the effects produced. But there are slighter injuries, which sometimes slowly, and after a protracted period, occasion no less serious results. A slight fall on the back, as on descending a stair, or a fall backwards, when the back, or even the os coccygis, strikes against a hard or sharp substance, is sometimes followed, if due care be not taken, by serious effects—by inflammation of the membranes of the chord, or even of the chord itself, and, if not rationally treated, and even when so treated in faulty constitutions, and if a proper regimen be not adopted, by paraplegia, often passing on to general paralysis, and ultimately terminating in coma and death.

26. Concussions of the spine occasioned by falls, or by leaping from great heights or other modes, are frequently followed by effects usually produced by the most severe injuries of the column, even although no fracture, rupture, or dislocation can be traced. The vertebræ and intervertebral cartilages may nevertheless have sustained some injury, and the minute organization of the chord and the origins of the nerves may have been ruptured or injured so as to escape detection after death upon a superficial inspection. In these cases, the severity of the effects will lead to a due appreciation of the importance of the cause. But a slight effect should not be unheeded; and even the most trivial symptom, apparently to the uninstructed or inexperienced, ought to attract to itself marked attention and care. Several instances have come under my care where the most dangerous and even hopeless consequences have followed the slightest falls and concussion, the more immediate effects having failed to attract the attention or care of the sufferer.

27. Amongst the less marked causes of disease of the spine or of its contents, although occasionally productive of the most important results, are muscular efforts in lifting heavy bodies, or similar efforts made suddenly or irregularly, and when volition is not duly exerted, or is directed also in a different direction. Rapid movements, torsions or bendings of the spine; undue pressure made upon one side of the vertebral bodies, by unnatural positions retained for a long time; frequent rotations of the column, and reaching to objects too high or too low, are occasionally productive of injurious effects. The most fatal injury may even follow a common or slight effort. A strong muscular man broke the second vertebra of the neck completely across on both sides when pressing his head on the pillow as a fulcrum to enable him to turn in bed, and the nature and extent of the injury were ascertained after death by Professor Quain and myself.

28. Curvatures of the spine often result from assuming the same position on frequent occasions —by sleeping on a high pillow on the same side, by improper postures in writing, playing on the harp or guitar, by drawing, by carrying a weight or burden on the same arm, as in nursing, and by always using one hand more than the other. Riding on horseback produces most injurious physical and moral effects on females: it gives the spine a certain degree of twist; and the concussions im-

parted to the nates, pelvis, and trunk, occasions a degree of excitement followed by exhaustion, which, if not amounting, often leads on, to self-pollution. To these apparently slight causes, especially to their continuance, the lateral curvatures of the spine, so very frequent in females, are in great measure to be attributed.

29. III. CURVATURES OF THE SPINAL COLUMN, — FLEXURES OF THE SPINE, — LATERAL CURVATURES OF THE SPINE,—*Lateral Deflections of the Vertebral Column; — Unnatural Deviations of the Spine.—Distortions of the Spine. — Functional Curvatures of the Spine.*

30. CLASSIF.—I. CLASS. IV. ORDER (*Author in Preface*).

31. DEFINIT.— *Unnatural curvatures of the vertebral column, occurring from other causes than from structural changes of the bodies of the vertebræ.*

32. Curvatures of the spine, produced otherwise than by caries or anchylosis of the vertebræ, may be divided into three *varieties or forms*, namely, *posterior curvature*, or excurvation, the convexity being directed backwards or outwards; — *anterior curvature*, or incurvation, the convexity being inwards or anteriorly;—and *lateral curvature*, the convexity being to either side, generally the right, and, when considerable, being either double or complicated. The angular projections occasioned by caries or anchylosis of the bodies of the vertebræ are altogether different in their natures from these curvatures, and fall under a different category of lesions.

33. i. POSTERIOR CURVATURE OF THE SPINE, — *Excurvation,* — *Cyphosis,* — affects chiefly the dorsal and cervical portions of the spine, and only occasionally extends to the upper lumbar vertebræ. It is often caused in infancy by the common practice of raising the child by the open hands placed under the arm-pits, whereby the ribs are pressed inwards, and the spine and sternum are pushed outwards, as described when treating of *deformities of the chest* (see *Art.* CHEST, §§ 2. *et seq.*), where the causes producing it are fully stated. Slighter forms of this curvature occur in young persons, and in adults, owing to shortness of sight and the habit of stooping, and holding the head near objects when reading, writing, or working; and in aged persons from diminished thickness and elasticity of the intervertebral cartilages, and in these the curvature extends lower in the spine. When the curvature is considerable, the anterior portion of the ring or body of each vertebra is rendered somewhat thinner or more flattened, especially in the centre of the curvature, —and, as a necessary consequence, the transverse processes, and still more so the spinous processes, are more separated. The ligaments are also affected, the posterior being more or less stretched. When the ribs are laterally compressed, so as to diminish the diameter of the chest from right to left, the sternum is pushed outwards, assuming a similar position to the dorsal spine. In other cases, the sternum follows the direction of the dorsal vertebræ, the ribs being curved outwards, and the diameter of the thorax being lessened between the spine and sternum. If the excurvation implicate the lumbar vertebræ, the angle formed by this part of the spine with the direction of the sacrum or pelvis is lost, and the brim of the pelvis becomes horizontal, the spine and the direction of the pelvis being in nearly the same axis. In excurvations of the spine, the capacity of the thoracic and abdominal cavities, and the position of the viscera, are more or less affected, the former being diminished, the latter being somewhat changed or embarrassed.

34. ii. ANTERIOR CURVATURE, — *Incurvation of the spine,* — *Lordosis.* — This form of spinal curvature is most rare. It is most frequently met with in a slight form in the lumbar vertebræ, and is then merely an exaggerated state of the curvature natural to this part of the spine, and is seen not infrequently in persons who, in early life, have brought their lumbar muscles into very active use. In other circumstances, however, it is occasionally observed giving the abdomen unusual prominence, and, when seated near the pelvis in females, presenting the appearance of pregnancy or of ovarian disease. When this curvature affects the dorsal vertebræ, it occasions marked deformity of the chest: the posterior angles of the ribs pass outwards and backwards from the spine, and the antero-posterior diameter of the thorax is diminished, unless, indeed, the sternum be also pushed forwards, which is rarely the case. When the anterior curvature is seated so low down in the lumbar region as to form an angle with the sacrum, the effect in females during parturition may be serious, as it is frequently connected with a diminished antero-posterior diameter of the brim of the pelvis.

35. This form of curvature may arise from an increased force, or more frequent and developed action, of the dorsal or lumbar extensor muscles, relatively to the vital tone or cohesion of the anterior ligaments of the spine, and to the action of the recti abdominal muscles; and it may be associated with some constitutional taint or disease, as with scrofula, rickets, syphilis, or some cachectic condition, &c. When it is connected with rickets, it is most apt to occur during convalescence from this malady.

36. iii. LATERAL CURVATURE. — *Lateral deflections of the spine,—Scoliosis.*—This is by far the most common form of spinal curvature; and generally appears between the ages of 10 and 18, although it may commence either earlier or later. It is most common in the upper and middle classes, and comparatively rare in the lower or harder working orders. Owing to the position of the viscera—to the heart on the left, and the liver on the right, it has been supposed that there is always a tendency to a double lateral curvature of the spine, especially in lymphatic, weakly constituted, and cachectic persons. There can be no doubt that, whatever influence may be produced by this circumstance, it is really so small as not to deserve consideration. The upper lateral curvature has generally its convexity to the left, is small, and comprises the lower cervical vertebræ with two or three dorsal vertebræ. The second or middle curvature is the most remarkable; has generally its convexity to the right, and is formed by the dorsal vertebræ. The third or lower curvature has its convexity to the left, and comprises the lumbar, and lowest dorsal vertebræ. The first or upper curvature may be very slight or altogether wanting, although the second or dorsal is considerable; but, in this case, this latter extends higher, and the third or lumbar is also considerable. Either the dorsal or lumbar may

be the most marked, more frequently the former, which, in some instances, may appear the chief or only one.

37. Lateral curvatures may be very slight, or they may be very great: they are seldom completely lateral, but are commonly conjoined with more or less posterior curvature. It is manifest that, when the deflections of the column are very considerable, the natural rotation of each vertebra on the other must be diminished or limited in the curvatures, and that it must take place chiefly between them, or between those vertebræ which remain the nearest to the natural axis of the trunk. The sides of the bodies of the vertebræ must also experience greater pressure towards the centres of the concavities and diminished pressure at their convexities: hence will result compression of the more yielding tissues and impaired rotation at the more flexed situations. The intervertebral tissues are first compressed in the sides, which are concave, and afterwards thinned. The bodies of the vertebræ are also more or less affected, and atrophied in these sides, and assume somewhat of a rhomboidal form. The articulating processes are much altered in the situations where the curvatures are greatest: they are atrophied, nearly obliterated, and absorbed in the concavities; and rendered more prominent, the spinous processes being also more protruded, in the convexities.

38. When lateral curvatures are very great, the effects become still more serious. The passages between the vertebræ for the nerves and bloodvessels are straitened and almost obliterated in the concave side, and enlarged and elongated in the convex. The consequences of the constriction of these outlets must be evident in respect of both nerves and bloodvessels. They were pointed out by MORGAGNI and PORTAL, and more recently insisted upon by CHAILLY and DUGES. The pressure, also, on the sides of the vertebræ sometimes causes partial absorption or caries of the part which suffers the most from it; and, in these situations, or where the concavity is greatest, ossific deposits are there formed, producing partial or lateral anchylosis, sometimes extending to the lateral, transverse, or oblique processes of articulation, and furnishing support to the most affected and weakened part of the spine. In these situations the ossific formation results from a state of chronic inflammation which is productive of this work of reparation.

39. The *consequences* of extreme or even of considerable lateral curvatures are often very serious. The patient is liable to severe pains, cramps, numbness, and impaired action of the muscles supplied by nerves issuing from the concave side of the spine, when the passages for the nerves and bloodvessels are narrowed. Emaciation frequently follows; and owing to the falling inwards and approximation of the ribs on the concave side of the curvature, and to the bulging outwards of those on the convex side, the cavities of the chest and abdomen are rendered more or less irregular or unsymmetrical, and are also much encroached on; the viscera, especially the lungs and heart, and even the liver, kidneys, and alimentary canal, are embarrassed or impeded in their functions; difficulty of breathing, amounting sometimes to orthopnœa, and palpitation, or slowness, or irregularity of the pulse often occurring, with a feeling of incapability of raising the ribs, or of taking a full inspiration, especially on the concave side. Frequently the viscera accommodate themselves to their unnatural position, when the curvatures increase gradually, and comparatively little inconvenience is experienced unless upon increased exertion; but, when these viscera, particularly the heart or lungs, are attacked by disease, to the causes of which their physical and vital conditions render them most susceptible, then the consequences are much more serious than when these organs are attacked in different circumstances.

40. It is very rare for the spinal chord or its membranes to experience much disorder during lateral curvature, unless the bodies of the vertebræ at the place of greatest concavity become inflamed or carious; but, when either of these results ensues, chronic inflammations, effusions, and organic changes occasionally supervene, in the parts contained by the diseased vertebræ, and the usual effects, namely, severe pain, spasms, and contractions of the muscles of the trunk and extremities and loss of motion, with or without loss of sensation, generally take place. The disease of these structures sometimes extends until the greater part of the spinal contents is invaded, and even until inflammatory action reaches the membranes of the brain, and occasions effusion within the cranium, coma, and death.

41. When the deviation is great, deformity is manifest as regards the position of the shoulder-blades, the collar-bones, and the pelvis. The muscles are also affected, those which are the least used becoming pale and atrophied; and the ribs are also more or less distorted, those on the concave side not merely being closely approximated, but, in old and extreme cases, becoming partially anchylosed. The chief curvature implicating the dorsal spine commonly presents its convexity to the right, pushing outwards the shoulder-blade, and causing the left shoulder-blade to fall inwards. When the chief curvature is in the lumbar region, it is generally directed to the left, and more or less posteriorly, the bodies of the vertebræ being considerably changed (§ 37.), and sometimes becoming even disorganised.

42. *The progress* of spinal curvatures is extremely variable. They sometimes proceed slowly and insensibly; occasionally rapidly. They have been said sometimes to occur suddenly and unexpectedly after a first confinement, and increase remarkably. It may be suspected that in such cases, the curvature had existed previously, but had been concealed by the dress; the puerperal states and lactation merely augmenting the deformity. Curvatures may proceed to a certain extent, and become stationary ever afterwards; or they may, upon the removal of the causes, and by proper means, be in great measure remedied. When neglected, they may be increased so as to bend the patient forwards or to either side, in a most surprising manner, the arm-pit almost reaching the hip-joint.

43. iv. The PROGNOSIS OF CURVATURES depends chiefly upon their extent, and upon the effect produced upon the spinal contents, upon the spinal nerves, and upon the viscera of the chest and abdomen. The curvature may be very great, and yet, as long as neither spasms, nor paralysis, nor marked embarrassment of the functions of vital or internal organs, nor other serious disorders,

supervene, reasonable hopes may be entertained of an advanced age being reached. The appearance of such disorder, as a manifest consequence of curvature, should suggest an unfavourable prognosis; the danger having stricter reference to the nature and extent of the consecutive disturbance, than to the amount of curvature. The removal of old curvatures is seldom attained with complete success; and, unless with the view of alleviating serious disorder occasioned by them, should not be rashly attempted; for adhesions, adaptations of parts, ossific formations even, and other alterations, may have taken place, that may not be disturbed, without occasioning more serious disturbance.

44. v. THE CAUSES which more especially occasion curvatures of the spine are the female sex; the age between 9 and 18; a lymphatic, scrofulous, or ricketty constitution; an originally weak conformation of frame; an exhausted, feeble, or cachectic habit of body; insufficient food, living in low, humid, and close situations, and all the causes productive of scrofula; convalescence from acute and chronic maladies; want of pure air, light, and sunshine; a premature and rapid growth; defective or improper exercise; crowded and close apartments during night and day; the continuance of mal-positions; the too exclusive use of the right hand and arm; the use of stays and metal or other supports, and self-pollution. MAYOW attributed curvatures to a want of harmony between the development of the vertebral column and that of the muscles; and MORGAGNI, MÉRY, and more recently GUÉRIN, believed that they are often caused by contraction of the muscles consequent upon disease of the nervous centres. MAYOW's hypothesis is incapable of support; the opinion of MORGAGNI is more deserving of attention, and may be admitted to be just in some instances.

45. vi. THE TREATMENT OF SPINAL CURVATURES, as promulgated to the public in recent times, would, in the hands of a MOLIÈRE, furnish a most bitter satire on medical practice:—so many writers, and so much said, and yet so little information furnished,—each successive author depreciating the means advised by his predecessors, and yet adding nothing to what was already known,—every new spine-doctor having his own apparatus, instrument, or couch to recommend and to sell, either or both being said to be capable of curing cases which were heretofore incurable, —the parading of casts of deformed trunks, rendered as symmetrical as the statues of antiquity by the newly discovered or peculiar method of treatment —the publication of books, containing merely exaggerated accounts of successful cases, without even, as in some of these publications, any notice of the methods employed,—the promulgation of opinions opposed to anatomical and physical truths to subserve delusion,—and large promises, but scanty performances, were amongst some of the means adopted by the majority of those who had chosen this *speciality*, as the best calculated to fulfil the objects of their professional mission. But it may be as well to take a brief view of the methods lately promulgated, and of the progress made (?) in this department of medical practice.

46. Mr. BAYNTON, in 1813, advocated rest for a long time in the horizontal position, on a specially constructed couch, but furnished no particulars of treatment.—Mr. SHELDRAKE in 1816, recommended an instrument of his own to support the weight of the head; and extension on an inclined plane, &c.—Mr. WILSON, in 1820, advocated chiefly muscular exercise directed especially to the dorsal muscles, the horizontal position occasionally; and he justly condemned all instruments which are made to act from the pelvis upwards, and which were then much in vogue among distorsion-curers.—Dr. JARROLD, in 1823, considered curvatures to depend upon constitutional causes, treated them accordingly, and prescribed chiefly muscular exercises, burnt sponge and carbonate of soda internally.—Mr. BAMPFIELD, in 1824, advised muscular exercises, extension of the spine by pulling the legs and arms, frictions and shampooings, and the use of instruments to exercise particular parts.—Dr. DODS, in 1824, objected to the inclined plane, to any spinal apparatus, and to the practice of carrying weights upon the head, as directed by some of his predecessors. He employed a concave couch to bend the whole spine forwards, and to relax the spinal muscles. The success of this plan must have been astounding! — Mr. JOHN SHAW, in 1827, resorted to muscular exercises, to supports for the spine, and to extension on a couch of his own contrivance. — Dr. HARRISON, after publishing numerous cases of vaunted success, and withholding any account of the means employed, produced, in 1827, a large book, which contained nothing but unsound views, exaggerated accounts, and a mystification as to his method of treatment. This, however, was nothing more than the horizontal position on a fixed mattress, friction, &c. This last he directed by means of assistants in such a manner as to lead his victims to persevere, and to inspire them with hopes which were rarely realised.—Mr. STAFFORD, in 1832, advised spinal supports, the horizontal position, conjoined with exercises.—Mr. BEALE, in 1833, recommended frictions, muscular exercises, mechanical extension, and instruments in certain cases.—Mr. COULSON, in 1839, prescribed suitable exercises, and condemned, with great justice, all kinds of collars, machines, or instruments.—Mr. WARD, in 1840, resorted to the recumbent position, to exercise of the muscles of the spine and head, and objected to mechanical supports.—Mr. TUSON, in 1841, advocated principally the recumbent position on a couch of his own contrivance, that admitted of muscular exercises while recumbent.—Mr. C. R. HARRISON, in 1842, published his work to say, that he cured deformities of the spine and chest by exercise alone, and without extension, without pressure,—the means empirically employed by his late namesake,—and without division of muscles — the division of muscles having been then brought into vogue from Germany, the fruitful parent of humbug, for curvatures, for squinting, and for every thing to which credulous fools would submit.—Mr. HARE, in 1844, wrote to recommend his couch, which acted on the spine by extension produced by pulleys and weights.—Mr. COLES, in 1845, praised the prone position, for which he constructed a couch on which the patient reposed upon his chest and abdomen, with exercise of the muscles of the spine and upper extremities.—Mr. TAMPLIN, in 1846, confided altogether in mechanical support by

means of a steel instrument, which he contrived for this purpose, based, like many of those employed by the instrument makers who had gone before him, to rest upon the pelvis. He condemned the horizontal position and all kinds of couches.—Mr. **Lonsdale**, who has furnished me, in his work, with a portion of the above information, in 1847, improved greatly on Mr. **Tamplin**'s instrument, adding its best and most original part, and recommended a couch which appears to be the best of all hitherto employed.

47. From this exordium, the reader will perceive the amount of information to be obtained from books, each one of which is written to recommend the practice adopted by its author to the notice of a "discerning public." Physicians are now-a-days allowed to have nothing to say to, far less to do with, this very notable "speciality," or indeed with any complaint, respecting which speciality-doctors have enlisted the "sweet voices" of the public. But physicians will nevertheless look on, and even observe closely the results, note the errors committed, mark the subterfuges resorted to, notice the delusions practised, and remark also the credulity, occasionally interrupted by passing visions of the truth, displayed by the victims during the protracted treatment of a spine-doctor. The study all the while is not without interest to the philosopher: the arts and cunning displayed to conceal expected want of success, and to ensure the faith and perseverance of the patient; the resignation of the latter, and the confident dogmatising of the former; the entire surrender of judgment, liberty, and opinion on the part of the devoted sufferer; the "hoping against hope," and the influence gained over weak minds by the assumed confidence, the decided manner and the repeated promises of the reputed deliverer, furnish food for contemplation and instructive illustrations of the constitution of the human mind. In this way, months, and even years, are passed; the submission and credulity of the one keeping due pace with the domination and perseverance of the other — the hopes entertained by the patient, that future success may ultimately compensate for the losses and sufferings and endurance of the past, protracting still further the period of empirical domination, until at last emancipation arrives; and the patient awakes to her condition, and arises with emaciated muscles, impaired strength, and with loss of the use of her limbs. Nevertheless, she may not confess her delusion. The power which had so long fettered her mind and body retains still a portion of its sway; and whilst she feels the bitterness of her delusion, she has no desire to admit her folly or to confess the full amount of its consequences. She consoles herself with the idea, assiduously inculcated by the persevering attendant, that, without the means of which she has been the victim, the deformity might have been much worse, and with thankfulness for this assurance, she submits to her fate, until another "unfailing method of treatment" excites her attention, when the desire of recovering her shape or of preventing extreme deformity again induces her to enter upon another protracted period of penance, the means being different but the results the same as heretofore.

48. Now, after the numerous repetitions of the means enumerated above, — after the endless variations, modifications, combinations, denunciations, &c. which the very imperfect list just furnished presents — what can I have to recommend, who have seldom had to deal with such cases, unless in rare instances when I have considered it right to interfere to prevent the dangerous consequences which would ensue, or were actually ensuing from a vicious system? What I therefore advise may be briefly enumerated in the following categories: —

49. *A.* To ascertain the several, and especially the chief causes of the curvature, extrinsic or physical, intrinsic or constitutional, mental or moral; to endeavour to estimate correctly their individual influences; and to direct a decisive and scrutinising inspection on their energetically inculcated removal and avoidance. If only one of the causes of mischief continue in operation the best devised treatment may be inefficacious.

50. *B.* To determine accurately the extent and nature of the curvature, the amount of deformity, and the degree in which it has involved the natural positions of the pelvis, shoulders, the clavicles, sternum and ribs; to ascertain in how far the shape and capacity of the thorax and abdomen are affected; to note the states of the digestive, assimilating, and excreting functions; to examine the condition of the muscular and fibrous structures, as manifested by the muscles of the trunk and extremities, and especially by those of the spine, and by the joints; to detect whatever disorder of the thoracic or abdominal organs the curvature may be associated with; to determine the state of the circulation and of the blood as respects the presence of chlorosis, anæmia, or plethora, and to ascertain the conditions of the uterine or sexual organs; and, having acquired all the information that can be obtained respecting these, and having reviewed this information in connexion with what is known as to the causes, to consider well the indications and means of cure which the whole inquiry may suggest.

51. *C.* Having commenced thus carefully, to put these intentions and means into practice, decidedly but cautiously, and in suitable combinations when such are clearly indicated: — (*a*) To pay strict attention to the restoration of the general health — to attend to the digestive and depurating functions, to the advantages of pure air, ventilation, sunshine, and suitable exercise, both before, and during, the employment of other means directed more especially to the removal of the curvature; and at the same time to have recourse to such tonics and restoratives as will promote assimilation.— (*b.*) To have recourse to instruments only when these are imperatively required, and to select such as will admit of the movements of the spinal muscles, and press upon the convexity of the curve. — (*c.*) If couches alone, or in addition to instruments, in the intervals between having recourse to them, or after due exercise, be absolutely required, to select those which furnish pressure chiefly on the convexity of curvature, and liberate the spine from the pressure and warmth of a supine position; and facilitate a recourse to frictions and other means of restoring the tone of the spinal muscles and ligaments. To each of these I would direct a more particular notice.

52. *D. The restoration of the general health* previously to, and during, a recourse to the more empirical and mechanical means adopted by those who take this particular class of affections under

their generous protection, is too generally neglected. Many of the causes most influential in producing curvature act chiefly by impairing the constitutional powers and the general health — by enfeebling the digestive and assimilating functions, by impeding the excreting actions, by relaxing the tone of the nervous and fibrous structures — and hence the importance of the entire removal of these causes, and of the restoration of these functions to health. Of all the causes of curvature, the most frequent, the presence of which it is the most difficult to ascertain, and the most seldom relinquished when so long practised as to produce this effect, is *self-pollution.* Its effects in exhausting organic nervous power, in emaciating the muscles, and in relaxing the ligaments, are much more remarkable than those of any other cause. Attention, therefore, should always be especially directed to its detection and entire relinquishment.

53. Restoration of the vital functions in spinal disorders should be directed not merely to the functions of digestion and excretion, but also to the conditions of the vascular system and of the uterine and urinary functions. If vascular plethora be not present — a condition which is seldom associated with curvatures — the preparations of iron are generally of service, especially if anæmia or chlorosis also exist. If neither of these be present, bitter infusions or decoctions may be first given, and afterwards the tincture of sesquichloride of iron, with or without a little hydrochloric acid, and the infusion or tincture of calumba, may be prescribed accordingly; but, in cases associated with anæmia or chlorosis, the preparations of iron should be adopted forthwith, especially if the urine be alkaline or contain much of the phosphates; and, in these circumstances, the preparation just named and the hydrochloric acid should be employed, and they may likewise be prescribed if the uterine discharge be great, or leucorrhœa be present. In other conditions, or when the catamenial evacuation is insufficient or obstructed, the sulphate of iron, with the aloes and myrrh pill, or the compound mixture of iron, with a sufficient quantity of the compound decoction of aloes to preserve the bowels freely open, will generally prove most beneficial.

54. *E.* Without due *ventilation, light, sunshine, and exercise in the open air,* short of occasioning fatigue, health will neither be restored nor preserved. Large airy sleeping apartments, the light of heaven, and *exercises* of the muscles of the back and extremities, are the most conducive to the prevention of curvatures, and to the restoration of the health of crooked persons. These persons should never ride on horseback, nor even in a carriage, when either can be avoided. Walking is the best exercise, and next to that such exercises as will moderately engage the muscles of the arms, shoulders, and back. Various modes of exercising these muscles have been recently recommended; but, whatever plan be followed, the muscles of both sides ought to be equally exercised. Certain exercises tend more to *prevent* curvature than to remove it; as the skipping-rope, shuttle-cock and battle-door, the use of dumb-bells, and exercises with the rod. The Indian sceptre exercises described by Mr. WALKER, in his work on "*Exercises for Ladies,*" are the best adapted to the prevention of curvatures and to the removal of those which are slight. When the curvature is more manifest, or even very great, pulleys should be fixed, at a considerable height above the patient's head, with weights attached to them, great in proportion to her age and strength, and in a situation which will admit of their being pulled in either a forward or backward direction. A stand, also, with a cross bar, or with more bars than one, considerably above the head of the patient, may be erected in a suitable open or airy situation; and, by taking a firm hold with both hands, attempts should be made, gently and cautiously at first, to raise the body by the muscles of the arms and shoulders. When the muscular debility is great, it is generally of great service to have recourse to frictions over the muscles of the spine and back with a warm stimulating liniment or embrocation, for some time previously to adopting these exercises. In 1822 the daughter of a friend had for a very long period been cased in metal instruments, and had suffered in health and strength, without any benefit as to the curvatures. I requested the instruments to be thrown aside, directed frictions to the spine and back, at night and in the morning, with the following liniment, and afterwards a gradual and careful recourse to the exercises just described. The cure was rapid, complete, and permanent.

No. 336. ℞ Balsami Peruviani, et Bals. Tolutani, āā, ʒj.; Olei Terebinthinæ, ℥j.; Linimenti Saponis ℥jss.; Olei Cajuputi ʒjss, Olei Olivæ, ℥jss. vel q. s. ut fiat Linimentum, more dicto utendum.

55. In many cases sponging the back with a strong solution of bay-salt, of a tepid warmth at first, and gradually reducing the temperature subsequently, will be of service, and may be employed once or twice daily. The exercises should be carefully directed, used for short periods only, especially at first, and never so long as to cause fatigue. In the intervals between exercise, the patient should assume the recumbent position — either supine or prone, or upon either side — on a firm horse-hair couch, either horizontal, or very slightly inclined, and with a low pillow. If the patient recline on the side, especially on the right side, or on that which presents the greatest convexity, she ought to place a horse-hair pillow under that part, so as to thrust the convexity towards the true axis of the spine, and retain it in that position as long as she can. Sleeping with too high a pillow, and generally on the same side — most frequently the right — often of itself produces slight curvature. In these cases, a different position should be chosen, the pillow ought to be placed under the side just beneath the arm-pit, when that side is reposed upon, and the patient should be induced to employ the arm and hand of the side on which the dorsal concavity exists.

56. *F. The use of instruments* has been very generally advised by both qualified and unqualified persons. They are required only in the more extreme cases of curvature, and at intervals, or only when it is necessary that the spine should be supported or aided in carrying the weight of the head and shoulders. Mr. LONSDALE's spinal support is the best hitherto constructed, inasmuch as it both supports the weight of the upper parts, and presses the convexity of the curvature inwards, or towards the true axis of the spine. The chief objection to this and all other instruments is the material of which they are constructed; for a broad hoop of iron or steel encircling the pelvis as a basis for support and pressure, and the other

metal parts forming the supports, springs, screws, &c., however well they may be padded, not only hamper or restrain the movements as long as they are applied, but also, and most injuriously, act as conductors of the electricity circulating through and on the surface of the body, conveying it into the atmosphere, especially during warm or humid states. The other instruments, which I have seen, besides those just mentioned, are altogether undeserving any notice.

57. *G. Of couches*, it is unnecessary to say much. A common horizontal couch, firmly made with horse-hair, or one very slightly inclined, is all that is required; but it should be well provided with hair-pillows of different sizes; and, when the patient reclines on the side with the dorsal convexity, a pillow should be placed under it in such a manner as to press it upwards; and when she reclines in any other position as well as in this, the pillow under the head should be low, unless, indeed, she attempts to lie on the side of the dorsal concavity, when it ought to be much higher. I have recommended this use of the pillows of the common sofa or couch for upwards of thirty years in the few occasional cases of curvature, which I have been requested to treat for other ailments; and I believe they are used in a similar manner by Mr. Shaw. In the excellent couch constructed by Mr. Lonsdale, a broad belt passes between supports attached to the sides of the couch, and the patient, when reclining, places the belt under the convexity, and has it drawn upwards; the weight of the body being in great part borne by the belt, which thus presses the convexity upwards. Another couch has been employed by Mr. Coles, for facilitating the prone position and exercise with the arms when this position is retained. It is well adapted to posterior curvature or excurvation of the spine, but it should be used with great caution when this curvature is owing to disease of the bodies of the vertebræ, as will be shown hereafter.

58. IV. Spinal Column—Nervous or Painful Affections of the.—Synon. :—Rachialgia (from *ραχις* the spine, and *αλγος* pain).—*Spinal irritation*, of several modern writers.

59. Classif.—I. Class. IV. Order (*Author*).

60. Definit.—*Pain in some part of the spinal column, generally accompanied by neuralgic or hysterical affections, unattended by fever, or by other indications of inflammation, injury, or structural change of the vertebral column, or of its contents.*

61. Painful affection of the spinal column may be limited to a single point or part, or it may affect more than one part, or extend along a considerable portion of the column. It may be continued, remittent, or intermittent, or even periodic. It may be *nervous* or *hysterical*, *rheumatic*, *gouty*, or *syphilitic*. When the pain is connected with any evidence of inflammation or injury, or structural change, it is merely a symptom of such lesion, and may be inconsiderable, or often not the most prominent symptom. It is generally difficult, and frequently almost impossible to determine, in the present state of our knowledge, the precise seat and nature of the pain which is so severely felt in the spine in nervous and hysterical subjects; but that it is chiefly functional, and intimately connected with pain in other situations, or with some other disorder, are well ascertained facts. How far these may illustrate the nature of true rachialgia will be considered hereafter.

62. i. Description.—The history and description of *spinal irritation* were first furnished by the Franks, under the denomination of *Rachialgia*, and subsequently considered by Nicod, Teale, Brown, Darwall, Tate, Parrish, Griffin, Entz, Ollivier, and Bennett. Most of these writers have viewed the complaint more or less in connexion with neuralgic and hysteric symptoms, and have overlooked some of its other morbid relations. It is generally a consequence of pre-existing disorder, more especially of hysteria, of uterine irritation or disorder, of prolonged leucorrhœa, or of excessive or disordered menstruation, of exhausting discharges, of gout, rheumatism, and several other chronic diseases, attended by debility or nervous exhaustion. It is *characterised* by pain, seated as mentioned above, increased by pressure on the spinous processes in the chief seat of pain, and often accompanied by painful, anomalous or hysterical symptoms in parts supplied with nerves from the seat of pain in the spine.

63. i. *A. Spinal irritation occasioning neuralgia or hysterical affections.*—This is the chief form in which painful affection of the spine presents itself in practice, especially in females, or in weakly constituted or debilitated males. If the reader refer to the article Sympathy he will there find an exposition of the connexion subsisting between the ganglial, sympathetic and spinal nerves, and of the manner in which irritation, undue excitement, or exhaustion, or altered sensibility of any one part of the sensory circle of nervous endowment, may implicate, in some way or other, distant parts,—may induce severe pain, in situations remote from the seat of irritation, or spasm, or various modifications of sensibility, or other anomalous affections. I have shown in various parts of this work, that irritation or other morbid states of parts of the alimentary canal, or of the uterine or sexual organs, or of the kidneys and urinary passages, may be propagated thence to the roots of the spinal nerves, to the chord, and be reflected from these, by either sensory or motive nerves, to internal or distant parts; and that the original seat of irritation may produce these effects, either functionally and without developing inflammatory or other palpable changes, or it may induce these changes, owing to prolonged endurance, to its violence, and to the nature of the exciting causes. (See arts. Chorea, Cholera, Convulsions, Hysteria, Disease, &c.)

64. The remarkable diversity of painful, anomalous and hysterical symptoms attending spinal irritation renders a detailed description of this affection unnecessary. The more prominent features are sufficient for its recognition. The distant symptoms or sympathies are often the only ailments to which the patient has directed attention, or even of which he is cognisant. But the physician, upon hearing of these, immediately infers that the disorder is merely manifested in the extreme ramifications of the nerves; and that it is actually either seated in the origins of these nerves, or that it is transmitted to the gangliated roots of these nerves from visceral or ganglial nerves, or that it has been thus transmitted, in the first instance, but followed, owing to the intensity

or continuance of the irritation, by disease at the origins of the nerves displaying the disorder. He therefore examines attentively the state of the spine, by pressure, percussion, or otherwise, especially at those situations where the nerves supplying the affected parts originate; and he often finds, although the patient has never complained of pain in any part of the spine, great pain in these situations, as well as increased disorder of the distant or external parts, when this examination is being made. Pain, more or less severe in the spine, is also excited by muscular efforts, by a sudden or quick movement or rotation of the spine, or by a jerk or slight concussion, or by taking a false step even in walking.

65. In connexion with the tenderness and pain in one or more parts of the spine, neuralgic pains, spasms or convulsive movements, great tenderness of the surface, sometimes loss or diminution of sensation, occasionally loss of motion or incomplete paralysis, and even, in severe or protracted cases, paraplegia; loss of motion being often more complete in one extremity than in the other, and sensation being but little impaired. When the spinal pain or tenderness is felt in the *dorsal portion*, it is sometimes referred chiefly to one side of the column, generally the left side, and extends to, or is felt only, beneath the left mamma, much more rarely on the right side or in the mamma itself. In these cases it is often associated with hysterical symptoms, with a sense of constriction about the thorax, or with a sense of suffocation, dyspnœa or orthopnœa, pleurodynia, palpitations, or accelerated or irregular action of the heart, spasmodic cough, and various other ailments, which present numerous changes and associations, certain of them ceasing suddenly, others appearing and becoming variously complicated, and often exaggerated by the fears of the patient, or the constant direction of the mind to them.

66. When the lumbar portion of the spine is chiefly affected, then the pains, altered sensibility, spasms, constriction, &c. are complained of in the parietes of the abdomen, or hypogastrium, and pelvis. Numbness, cramps, pains, excessive tenderness, or even more or less complete paralysis in the most severe cases, are experienced in the lower extremities, with constipation, suppression or retention of urine, or irritability of the urinary bladder or uterine organs, disordered menstruation, morbid sensibility of the genito-urinary organs, and occasionally a marked and variable alteration of the state, constitution and quantity of the urine itself.

67. Spinal irritation of the cervical portion is not so frequent as in the situations just mentioned; but it is often connected with a similar affection of one or other of these, especially with the dorsal pain and tenderness. Sometimes the cervical pain rises as high as the occiput, and is then associated with neuralgic pains in the face or neck, with deafness or noise in the ears, difficulty of swallowing, a sense of choaking, loss of voice and even of speech, spasm of the larynx or a state resembling an attack of spasmodic croup, and urgent sense of suffocation, complete aphonia, violent attack of suffocative cough, altered sensibility, or incomplete paralysis of one or both arms, coldness and numbness of one or both hands, pricking sensations, formications, &c., in these extremities, with more or less variability and irritability of temper, and often with several of the other ailments enumerated above.

68. The spinal tenderness in some cases shifts its situation. In these, the sympathetic affections are also changed. In connexion with the symptoms already noticed, the functions of the thoracic and abdominal viscera, and even those of the organs of sense, are more or less disordered, but in various and constantly varying degrees, the seat of disorder depending much upon the portion of spine affected. When the disorder is of a very severe character; when epilepsy, convulsions, amaurotic symptoms, deafness, hesitation or difficulty of speech, retention or suppression of urine, hiccup, vomitings, gastrodynia, obstinate constipation, paralysis, &c. take place, then it becomes a matter of doubt whether or no the spinal affection has proceeded to inflammatory action, or has extended to the base of the brain, or to serious congestion of the spinal veins, with increased serous effusion; and a careful consideration of all the sympathetic and constitutional features of the case is then especially requisite.

69. *B. Rheumatic, gouty, and syphilitic* forms of rachialgia, or painful affection of the spine, especially the rheumatic and gouty, are not infrequent — *(a)*. The *rheumatic* occurs chiefly in the rheumatic diathesis; in persons who have suffered previously from rheumatism, and very probably is seated chiefly in the fibrous structures of the spinal column, in the ligaments of the spine, and probably also in the intervertebral structure. It is experienced principally on motion, and in portions of the spine which has been the seat of previous injury, sprain, twist, &c. It is generally diminished by the warmth of bed and by the recumbent posture; and it is often accompanied by several of the sympathetic affections already mentioned; but, when these are severe, and are obviously connected with the seat of pain in the spine — when cramps, numbness, constrictive pain in the muscles, prickings in the extremities, loss of motion, &c.,—then the supervention of inflammatory action, or of effusion, or of thickening of the affected tissues, or of congestion of the vascular apparatus of the spine, should be dreaded, even if not actually existing.

70. *(b)*. *Gouty rachialgia* is common in old gouty subjects; affects chiefly the lumbar region; is often attended by weakness or impaired motion of the lower extremities, by incontinence of urine, and by other disorders of the urinary organs, or of the urinary secretion itself, varying with the duration and amount of the spinal affection. Gouty rachialgia is chiefly to be referred to congestion of the venous sinuses of the vertebral canal; this congestion probably inducing an increased fluid effusion, with thickening of the ligaments and fibrous tissues of the vertebræ external to the canal; the functions of the chord, or roots of the nerves, being thereby more or less embarrassed.

71. *(c)*. *Syphilitic rachialgia* sometimes occurs in the secondary or tertiary stage of syphilis. It may affect the bodies of the vertebræ, or the intervertebral structures, or the ligaments; but it is very doubtful whether or no it exists as a purely nervous affection in the course of this constitutional malady, before these structures are attacked by the changes characterising the advanced progress of this malady. The portion of the spine most frequently attacked by syphilitic lesion, ac-

cording to my experience, is the cervical, the spinal lesion appearing to me to have been an extension of the alterations which had taken place in the throat and pharynx.

72. (*d*). *Scrofulous rachialgia* may be referred to slow inflammatory change, or to tuberculous deposits, in the bodies of the vertebræ; and hence it, as well as the syphilitic, hardly falls under the present category, but comes more legitimately under the head of *disease of the bodies of the Vertebræ.*

73. ii. The DIAGNOSIS of spinal irritation, or pain in the spine, appearing independently of inflammatory or structural lesion, is by no means so easy as several recent writers appear to believe. Whether the painful affections of the spine are the chief disorder, or are attended by various symptomatic disorders of a more prominent character even than their parent affection, they often so nearly approach the milder grades of inflammatory action, in some one or more of the tissues of the spine, that a precise line of demarcation can hardly be drawn between them. An affection which may be, with much justice, viewed as functional to-day — as spinal irritation merely — may be inflammatory on the morrow, and be rapidly followed by the consequences of inflammation. Or a case may occasion apprehensions of inflammation, and yet, as respects its progress and treatment, prove functional merely; whilst another, furnishing less serious grounds of apprehension, may have been actually inflammatory, and soon furnish undoubted evidence of the usual results of inflammation.

74. The diagnosis between functional and structural rachialgia requires a most attentive consideration of all the circumstances of the case, after a careful examination of the spine, and of the whole extent of constitutional and symptomatic ailment. Messrs. GRIFFIN, who have written with much ability upon this affection, have given the following indications of its existence, especially in its nervous or hysterical form: — "1st. The pain or disorder of any particular organ being altogether out of proportion to the constitutional disturbance. 2nd. The complaints, whatever they may be, usually relieved by the recumbent posture, always increased by lifting weights, bending, stooping, or twisting the spine, and among the poor classes often consequent on the labour of carrying heavy loads, as in drawing water, manure, &c. 3dly. The existence of tenderness at that part of the spine which corresponds with the disordered organ, and the increase of pain in the organ by pressure on the corresponding region of the spine. 4th. The disposition to a sudden transference of the diseased action from one organ or part to another, or the occurrence of hysterical symptoms in affections apparently acute. 5th. The occurrence of fits of yawning or sneezing, which, though not very common symptoms, yet, as scarcely ever occurring in acute or organic diseases, may generally be considered as characteristic of nervous irritation." (*Op. cit.* p. 214.)

75. These may be viewed rather as aids to the diagnosis of this affection than as establishing its existence independently of inflammatory action; for many cases, which have been viewed merely as functional, although presenting some degree of prominence of the spinous processes, in the seat of tenderness, certainly are attended by more or less inflammatory action, or congestion, with swelling of the vertebral tissues, the local changes being insufficient to cause very manifest constitutional disturbance, or to disorder the vital and excreting functions. When, however, these are disordered, the existence of inflammatory action or congestion should be suspected. In all cases presenting swelling or prominence in any marked degree, it will be safer to view this as a result of a mild and slow form of inflammation or congestion, or inflammatory congestion, with slight effusion, than to consider the disorder as merely nervous. (*See the description of disease of the Vertebræ.*)

76. iii. The DURATION AND PROGNOSIS of spinal irritation require but slight notice. — (*a*). The *duration* of this disorder is most variable. It may be only three or four days, or as many months, or even as many years, according to the severity, the causes and the treatment of individual cases. There is every reason to infer that the more obstinate cases, especially where the treatment has been judicious, is perpetuated either by the continuance of their causes, or by a chronic or recurring inflammatory congestion of one or more of the tissues of the spine.

77. (*b.*) The *prognosis* of this affection is generally favourable, where it is purely nervous or functional. But, when it is attended by phenomena, local and constitutional, indicative of any degree of inflammatory congestion, the several contingencies of such disorder, as respects both the vertebræ and the spinal contents, should be kept in view, and a more cautious or guarded prognosis be given. When rachialgia occurs in connexion with rheumatism, or gout, or scrofula, or syphilis, a much less favourable prognosis ought to be given, than when it is more purely nervous, or simply congestive or inflammatory. In the rheumatic variety there is danger of the affection extending from the ligamentous or fibrous structure to the membranes of the spinal chord; and in the gouty form, especially if it be associated with disorders of the secretion or excretion of urine, a favourable result is often long deferred, or even unattainable in very aged persons; whilst in the scrofulous and syphilitic states of the affection, disease of the bodies of the vertebræ, if not constantly, is generally present, and the prognosis is consequently very unfavourable.

78. iv. The CAUSES of spinal irritation have been already noticed (§§ 16. *et seq.*) when treating of the causes of spinal diseases generally; but there are certain causes which are more especially productive of painful or functional disorders of the spine. These are certainly much more frequent in females than in males, the female clothing and physical education of the sex favouring, as shown above (§ 18.), this result. Of 248 cases adduced by Mr. GRIFFIN, 26 only were males. It may occur at any age between 10 and 65; and the gouty and rheumatic forms at much more advanced ages. The nervous variety, the most common in females, is met with from 15 years of age to 65, but most frequently from 20 to 25; in its hysterical form from 15 to 50, the menstrual epoch of female existence. It is much more frequent in the unmarried than in the married, and is not confined to any particular habit of body or temperament; the nervous and lymphatic temperaments, however, predominating. The most common exciting causes are, self-pollution, excessive sexual intercourse, uterine disorder, affections of the